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For related information see also *Astronautics*.

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Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1004**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1005**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1006**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1009**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1010**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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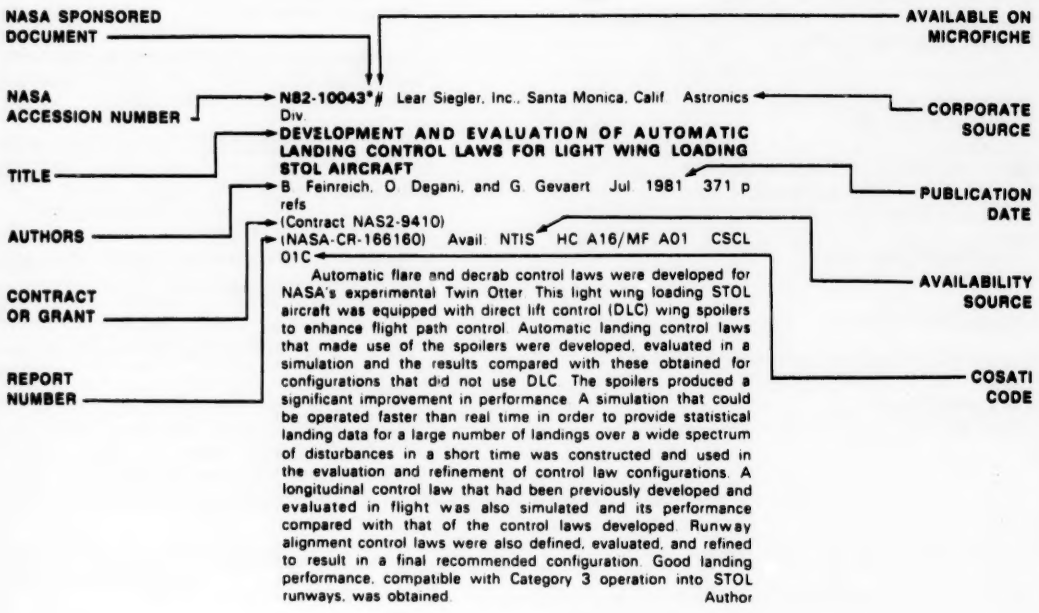
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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
TITLE
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
PUBLICATION DATE
AUTHORS
(Contract NAS2-9410)
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
AVAILABILITY SOURCE
CONTRACT OR GRANT
REPORT NUMBER
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained.
Author

VOLUME 20 NUMBER 7 APRIL 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-16040* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 141, NOVEMBER 1981
Nov. 1981 122 p
(NASA-SP-7037(141)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 404 reports, articles, and other documents introduced into the NASA scientific and technical information system in October 1981. Author

N82-16041* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 142
Dec. 1981 114 p
(NASA-SP-7037(142)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 398 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1981. A.R.H.

N82-16042*# Boeing Vertol Co., Philadelphia, Pa.
PREDESIGN STUDY FOR A MODERN 4-BLADED ROTOR FOR THE NASA ROTOR SYSTEMS RESEARCH AIRCRAFT
H. E. Bishop, J. E. Burkam, R. C. Hemingway, C. N. Keys, K. E. Smith, J. H. Smith, and J. A. Staley Jan. 1981 312 p refs
(Contract NAS2-10689)
(NASA-CR-166153) Avail: NTIS HC A14/MF A01 CSCL 01B

Trade-off study results and the rationale for the final selection of an existing modern four-bladed rotor system that can be adapted for installation on the Rotor Systems Research Aircraft (RSRA) are reported. The results of the detailed integration studies, parameter change studies, and instrumentation studies and the recommended plan for development and qualification of the rotor system is also given. Its parameter variants, integration on the RSRA, and support of ground and flight test programs are also discussed. Author

N82-16043*# Hughes Helicopters, Culver City, Calif.
PRE-DESIGN STUDY FOR A MODERN FOUR-BLADED ROTOR FOR THE ROTOR SYSTEM RESEARCH AIRCRAFT (RSRA) Final Report
Charles W. Hughes and Andrew H. Logan Mar. 1981 140 p refs
(Contract NAS2-10690)
(NASA-CR-166154) Avail: NTIS HC A07/MF A01 CSCL 10A

Various candidate rotor systems were compared in an effort to select a modern four-bladed rotor for the RSRA. The YAH-64 rotor system was chosen as the candidate rotor system for further development for the RSRA. The process used to select the rotor system, studies conducted to mate the rotor with the RSRA and provide parametric variability, and the development plan which would be used to implement these studies are presented. Drawings are included. A.R.H.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-16044*# Universities Space Research Association, Columbia, Md.
CAS22 - FORTRAN PROGRAM FOR FAST DESIGN AND ANALYSIS OF SHOCK-FREE AIRFOIL CASCADES USING FICTITIOUS-GAS CONCEPT Final Report
Djordje S. Dulikravich and Helmut Sobieczky (DFVLR-Inst. fuer Theoretische Stroemungsmechanik, Goettingen, West Germany) Washington NASA Jan. 1982 59 p refs
(Contract NAS3-22532)
(NASA-CR-3507) Avail: NTIS HC A04/MF A01 CSCL 01A

A user-oriented computer program, CAS22, was developed that is applicable to aerodynamic analysis and transonic shock-free redesign of existing two-dimensional cascades of airfoils. This FORTRAN program can be used: (1) as an analysis code for full-potential, transonic, shocked or shock-free cascade flows; (2) as a design code for shock-free cascades that uses Sobieczky's fictitious-gas concept; and (3) as a shock-free design code followed automatically by the analysis in order to confirm that the newly obtained cascade shape provides for an entirely shock-free transonic flow field. A four-level boundary-conforming grid of an O type is generated. The shock-free design is performed by implementing Sobieczky's fictitious-gas concept of elliptic continuation from subsonic into supersonic flow domains. Recomputation inside each supersonic zone is performed by the method of characteristics in the rheograph plane by using isentropic gas relations. Besides converting existing cascade shapes with multiple shocked supersonic regions into shock-free cascades, CAS22 can also unchoke previously choked cascades and make them shock free. A.R.H.

N82-16045*# Pennsylvania State Univ., University Park. Applied Research Lab.
THE BOUNDARY LAYER ON COMPRESSOR CASCADE BLADES Semiannual Progress Report, 1 Jun. - 1 Dec. 1981
Steven Deutsch 1 Dec. 1981 19 p refs
(Grant NsG-3264)
(NASA-CR-165079) Avail: NTIS HC A02/MF A01 CSCL 01A

Some redesign of the cascade facility was necessary in order to incorporate the requirements of the LDA system into the design. Of particular importance was the intended use of a combination of suction upstream of the blade pack with diverging pack walls, as opposed to blade pack suction alone, for spanwise dimensional-

ity control. An ARL blade was used to redo some tests using this arrangement. Preliminary testing and boundary layer measurements began on the double circular arc blades. A.R.H.

N82-16046*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
SUMMARY OF THEORETICAL CONSIDERATIONS AND WIND TUNNEL TESTS OF AN AERODYNAMIC SPOILER FOR STALL PROOFING A GENERAL AVIATION AIRPLANE
Howard L. Chevalier Jan. 1982 55 p refs
(Grant NsG-1407)
(NASA-CR-165100) Avail: NTIS HC A04/MF A01 CSCL 01A

An airplane stall proofing system utilizing a spoiler was investigated for application on a low wing airplane representative of typical general aviation aircraft. Tests of the full scale airplane were conducted in the NASA Langley 30 x 60 foot full scale wind tunnel. The test velocity was 86 feet per second, corresponding to a Reynolds number of 2.20 million. The stall proofing capability of the spoiler is shown and a theoretical approach to the design of the spoiler and analysis of the spoiler's contribution to the airplane's trim and longitudinal stability is verified. Controlled spoiler deployment in a narrow angle of attack range, 4 degrees, immediately preceding the stall angle will stall proof the airplane. The results also show some of the limitations of flight tests to determine spoiler deployment rate for good handling qualities. M.G.

N82-16047*# Polytechnic Inst. of New York, Brooklyn. Dept. of Mechanical and Aerospace Engineering.
CALCULATION OF THREE-DIMENSIONAL, INVISCID, SUPERSONIC, STEADY FLOWS Final Report
Gino Moretti Dec. 1981 120 p refs
(Grant NsG-1248)
(NASA-CR-165110; POLY/M/AE-81-25) Avail: NTIS HC A06/MF A01 CSCL 20D

A detailed description of a computational program for the evaluation of three dimensional supersonic, inviscid, steady flow past airplanes is presented. Emphasis was put on how a powerful, automatic mapping technique is coupled to the fluid mechanical analysis. Each of the three constituents of the analysis (body geometry, mapping technique, and gas dynamical effects) was carefully coded and described. Results of computations based on sample geometrics and discussions are also presented. M.D.K.

N82-16048*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
A UNIFIED THERMAL AND VERTICAL TRAJECTORY MODEL FOR THE PREDICTION OF HIGH ALTITUDE BALLOON PERFORMANCE Final Report
Leland A. Carlson and Walter J. Horn Jun. 1981 90 p refs
(Contract NAS6-3072)
(NASA-CR-156884; TAMRF-4217-81-01) Avail: NTIS HC A05/MF A01 CSCL 01A

A computer model for the prediction of the trajectory and thermal behavior of zero-pressure high altitude balloon was developed. In accord with flight data, the model permits radiative emission and absorption of the lifting gas and daytime gas temperatures above that of the balloon film. It also includes ballasting, venting, and valving. Predictions obtained with the model are compared with flight data from several flights and newly discovered features are discussed. Author

N82-16049*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF IMAGE PROCESSING TECHNIQUES TO FLUID FLOW DATA ANALYSIS
Charles C. Giamati 1981 16 p Presented at the 11th Ann. Computer Output Microfilm (COMtec) Conf., Lincolnshire, Ill., 24-26 Feb. 1981
(NASA-TM-82760; E-1081) Avail: NTIS HC A02/MF A01 CSCL 01A

The application of color coding techniques used in processing remote sensing imagery to analyze and display fluid flow data is discussed. A minicomputer based color film recording and color CRT display system is described. High quality, high resolution images of two-dimensional data are produced on the film recorder. Three dimensional data, in large volume, are used to generate color motion pictures in which time is used to represent the third dimension. Several applications and examples are presented. System hardware and software is described. M.G.

N82-16050# National Aerospace Lab., Tokyo (Japan).
SOME EXPERIMENTAL INVESTIGATIONS ON TRANSONIC FLUTTER CHARACTERISTICS OF THIN PLATE WING MODELS WITH SWEPTBACK AND TAPERED TIPS
Eiichi Nakai Sep. 1981 49 p refs In JAPANESE; ENGLISH summary
(NAL-TR-682; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Some experimental investigations on the transonic flutter characteristics were conducted using thin plate cantilevered wing models with sweptback tapered tips, which were elastically supported at the root, in the NAL 0.6m x 0.6m transonic blowdown wind tunnel for flutter testing in the range of Mach numbers from 0.804 to 1.171. The wing models have the tip planform of sweptback angles of 35 degrees at the leading edge and 30 degrees at 1/4 chord line, and an aspect ratio of 1.017 and a taper ratio of 0.6. It is concluded that the flutter boundaries of the wing models have been obtained and the boundaries expressed by the 'experimental flutter speed coefficient' are characterized as having minimum values at around Mach number 1.0. It is also concluded that the considerable increase in the flutter instability area is caused by the decrease in the stiffness of the elastic support at the root of the model. Author

N82-16051# Air Force Flight Test Center, Edwards AFB, Calif.
A METHOD OF ESTIMATING UPWASH ANGLE AT NOSEBOOM-MOUNTED VANES Final Report
Kenneth Rawlings, III Jun. 1981 115 p refs
(AD-A106160; AFFTC-TIM-81-1) Avail: NTIS HC A06/MF A01 CSCL 20/4

This technical information memorandum documents a theoretically-based method of estimating the upwash angle at noseboom-mounted vanes of an arbitrary aircraft. The method is commonly called the Yaggy-Rogallo technique and has been used successfully for many years at the NASA/Dryden Flight Research Center (NASA/DFRC) and the Air Force Flight Test Center (AFFTC). The technique divides any aircraft into a collection of bodies of revolution and thin airfoils, makes upwash angle estimates for each component, and combines the individual estimates into a single estimate. Development of the theory for upwash angle estimates of both bodies of revolution and thin airfoils are presented. Recent improvements in solution and use of the Yaggy-Rogallo equations are also presented. Guidelines for using the upwash angle estimates in data reduction and analysis are presented along with comparisons to flight test upwash calibration data showing excellent results. FORTRAN V computer programs were written to simplify and expedite making upwash angle estimates. Listings of the program code, a user's guide, and a programmer's guide are included in the memorandum. Author (GRA)

N82-16052# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THE ANALYSIS AND DESIGN OF TWO-ELEMENT AIRFOIL CONFIGURATION IN TRANSONIC FLOW Final Report, 19 May 1975 - 30 Aug. 1979
Giuseppe Volpe Oct. 1981 67 p refs
(Contract N00014-75-C-0722)
(AD-A107547; ONR-CR-215) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the development of numerical techniques for predicting the flow over two-element airfoil configurations, such as airfoils with a slat or a flap, at transonic speeds and for designing such airfoil systems. The effort was divided in three phases. The first phase involved the development of a method to compute the inviscid flow over these configurations. In the second phase the inviscid code was coupled to a boundary layer calculation program in order to compute the loss in performance due to viscous effects. In the third phase an inverse design code that constructs the airfoil system corresponding to a desired pressure distribution was developed. Author (GRA)

N82-16053# Grumman Aerospace Corp., Bethpage, N.Y.
NONLINEAR ANALYSIS OF INTERFERING BODIES IN SUPERSONIC FLOW Final Report, 17 Mar. 1980 - 16 May 1981
Frank Marconi Jul. 1981 63 p refs
(Contract F49620-80-C-0044; AF Proj. 2307)
(AD-A108071; RE-631; AFOSR-81-0771TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes a study of the flow field about interfering bodies in a supersonic stream and is directed toward the prediction of supersonic store carriage/separation. The development of computational techniques aimed at producing a usable code is discussed. The code includes a characteristic based finite difference scheme to solve Euler's equations and a new and general shock fitting scheme. One problem uncovered during this first years effort is that of transition from a regular reflection to a Mach disc shock configuration. The basic finite difference scheme has been exercised extensively and was proven sound. More importantly the new shock fitting scheme is able to predict complex interactive shock patterns. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-16054# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
THE PREVALENCE OF VISUAL DEFICIENCIES AMONG 1979 GENERAL AVIATION ACCIDENT AIRMEN
J. R. Dille and C. F. Booze, Jr. Jul. 1981 10 p refs
(AD-A106489; FAA-AM-81-14) Avail: NTIS HC A02/MF A01 CSCL 01/2

Analyses of the accident experience of pilots who were monocular, did not meet (even the liberal) vision standards, had color vision defects and no operational restrictions, or wore contact lenses, have shown higher-than-expected accident experience in previous studies. However, no causal role had been assigned by accident investigators and reexamination of the records failed to show any obvious pattern or relationship between the defects and the accidents. In the present study of 1979 accidents, the relatively small number of pilots with aphakia and artificial lens implants, as well as the total eye pathology population, had significantly higher accident rates, but the monocular pilots did not. Again, no causal role had been ascribed. Some associations are debatable, but there is no clear recurring problem. There are still unresolved questions about the consistent operational performance of monocular pilots, those who are not fully corrected to 20/20 distant visual acuity bilaterally, airmen with near vision deficiencies only who are not required to wear corrective glasses, those without fusion, and several with appreciable pathology who have 20/20 corrected central visual acuity but about whom we know very little concerning their dynamic, peripheral, depth or accommodative function.
Author (GRA)

N82-16055# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A GENERALIZED ESCAPE SYSTEM SIMULATION COMPUTER PROGRAM: A USER'S MANUAL Final Report
Louis A. DAulerio, Kathleen M. Breakey (Computer Sciences Corp., Huntington Valley, Pa.), Shirley W. Trimble (Computer Sciences Corp., Huntington Valley, Pa.), and Bruce Waldron (Computer Sciences Corp., Huntington Valley, Pa.) Aug. 1981 105 p
(Contract N62269-78-C-0191)
(AD-A106152; NADC-81224-60) Avail: NTIS HC A06/MF A01 CSCL 01/3

The Generalized Escape System Simulation Computer Program was developed to simulate the operation of various ejection seats. The program generates a three dimensional trajectory of the ejection seat and its occupant, and is intended to be used in the evaluation of ejection seat design and performance. The program is written in FORTRAN IV and is highly structured for ease of modification and updating. This report outlines the steps necessary to succesfully execute the program. Author (GRA)

N82-16056# Army Research and Technology Labs., Fort Eustis, Va. Applied Technology Lab.
TEST AND EVALUATION OF IMPROVED AIRCREW RESTRAINT SYSTEMS
G. T. Singley, III Sep. 1981 352 p refs
(DA Proj. 1L1-62209-AH-76)
(AD-A107576; USAAVRADCOM-TR-81-D-27) Avail: NTIS HC A16/MF A01 CSCL 01/3

US Army aviation accident data shows that a majority of all injuries in attack helicopters could have been avoided if these aircraft had been equipped with crashworthy seat and restraint systems. The compactness of the cockpit and the close proximity of mission equipment to the aircrew in attack and scout helicopters pose serious crash impact hazards. Although not desirable from a crashworthiness standpoint, operational considerations may dictate that mission equipment and structure be located within the occupant's crash impact motion envelope, particularly for his head. The cockpit can be delethalized further when the improved restraint is complemented by padding potential strike surfaces in the cockpit; making contact surfaces frangible; and providing weapon system sights with frangibility, telescoping, and/or swing-away features. This report presents the results of an effort to test and compare the potential of several aircrew restraint systems to reduce the crash impact motion envelope of helicopter aircrewmen. Author (GRA)

N82-16057# Department of Energy, Washington, D. C.
SYMPOSIUM ON COMMERCIAL-AVIATION ENERGY-CONSERVATION STRATEGIES
1981 373 p refs Proceedings of Symp. on Commercial Aviation Energy Conserv. Strategies, Washington, D.C., 2-3 Apr. 1981 Sponsored in part by FAA, Washington, D.C.
(DE81-028406; CONF-8104103) Avail: NTIS HC A16/MF A01

Energy conservation strategies applicable to commercial aviation are presented. General topics discussed include Federal and industry conservation programs such as flight operations, air traffic control, engineering and maintenance, and corporate management strategies. Included is a discussion of possible future actions. DOE

N82-16058# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
SPECIAL INVESTIGATION REPORT. SEARCH AND RESCUE PROCEDURES AND ARMING OF EMERGENCY LOCATOR TRANSMITTER: AIRCRAFT ACCIDENT NEAR MICHIGAN CITY, INDIANA, 7 DECEMBER, 1980
11 Aug. 1981 19 p
(PB81-249427; NTSB-SIR-81-2) Avail: NTIS HC A02/MF A01 CSCL 01B

A special investigation of the circumstances surrounding the crash of a Beechcraft E-90, near Michigan City, Indiana, on December 7, 1980 and of the search and rescue activities following the accident, and the associated operation of the aircraft's emergency locator transmitter (ELT) is presented. As a result of not following proper notification procedures, coordination oversights, and communicaton gaps, the search for the missing aircraft was significantly hampered. The actual crash site was not reached by search personnel until nearly 4 hours after the crash. Some or all of the aircraft's four occupants, who died of hypothermia, probably survived the original crash. Examination of the ELT switch revealed that it was in the OFF position. A rescue could have been effected if the proper authorities had been notified and given the aircraft's last known position. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-16059* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPECTRALLY BALANCED CHROMATIC LANDING APPROACH LIGHTING SYSTEM Patent
Wendell D. Chase, inventor (to NASA) Issued 22 Sep. 1981 10 p Filed 10 Dec. 1976 Supersedes N77-12031 (15 - 03, p 0286)
(NASA-Case-ARC-10990-1; US-Patent-4,291,294; US-Patent-Appl-SN-749420; US-Patent-Class-340-26; US-Patent-Class-244-114R) Avail: US Patent and Trademark Office CSCL 17G

Red warning lights delineate the runway approach with additional blue lights juxtaposed with the red lights such that the red lights are chromatically balanced. The red/blue point light sources result in the phenomenon that the red lights appear in front of the blue lights with about one and one-half times the diameter of the blue. To a pilot observing these lights along a glide path, those red lights directly below appear to be nearer than the blue lights. For those lights farther away seen in perspective at oblique angles, the red lights appear to be in a position closer to the pilot and hence appear to be above the corresponding blue lights. This produces a very pronounced three dimensional effect referred to as chromostereopsis which provides valuable visual cues to enable the pilot to perceive his actual position above the ground and the actual distance to the runway. Official Gazette of the U.S. Patent and Trademark Office

N82-16060*# Analytical Mechanics Associates, Inc., Hampton, Va.
TERMINAL AREA AUTOMATIC NAVIGATION, GUIDANCE, AND CONTROL RESEARCH USING THE MICROWAVE LANDING SYSTEM (MLS). PART 3: A COMPARISON OF WAYPOINT GUIDANCE ALGORITHMS FOR RNAV/MLS TRANSITION Final Report
Samuel Pines Washington NASA Jan. 1982 87 p refs
(Contract NAS1-15116)
(NASA-CR-3512; AMA-81-7) Avail: NTIS HC A05/MF A01 CSCL 17G

The results of an investigation carried out for the Langley Research Center Terminal Configured Vehicle Program are presented. The investigation generated and compared three path update algorithms designed to provide smooth transition for an aircraft guidance system from DME, VORTAC, and barometric navaids to the more precise MLS by modifying the desired 3-D flight path. The first, called the Zero Cross Track, eliminates the discontinuity in cross track and altitude error by designating the first valid MLS aircraft position as the desired first waypoint, while retaining all subsequent waypoints. The discontinuity in track angle is left unaltered. The second, called the Tangent Path also eliminates the discontinuity in cross track and altitude and choose a new desired heading to be tangent to the next oncoming circular arc turn. The third, called the Continued Track eliminates the discontinuity in cross track, altitude and track angle by accepting the current MLS position and track angle as the desired ones and recomputes the location of the next waypoint. A method is presented for providing a waypoint guidance path reconstruction which treats turns of less than, and greater than, 180 degrees in a uniform manner to construct the desired path. Author

N82-16061# Rome Air Development Center, Griffiss AFB, N.Y.
PASSIVE TRILATERATION POSITIONING PROCEDURE ERROR ANALYSIS
Dean C. Merchant Aug. 1981 25 p ref
(AF Proj. 4594)
(AD-A106690; RADC-TR-81-225) Avail: NTIS HC A02/MF A01 CSCL 17/7

This report presents the results of a conceptual and analytical study pertaining to the propagation of errors through a spatial trilateration network. The network consists of an aircraft, DME ground based units and an independent ground based tracker. The primary error sources treated are DME range errors, geodetic coordinate errors of the ground based DME units, timing errors and the 'Geodetic slice' between the local survey relating DME stations and the ground based tracker. The result is an algebraic tool for studying the influences of various system errors and geometry on the error in positioning an aircraft with respect to a ground based tracking unit. Author (GRA)

N82-16062# Eclectech Associates, Inc., North Stonington, Conn.
SIMULATOR EVALUATION OF ELECTRONIC RADIO AIDS TO NAVIGATION DISPLAYS. THE RA-2 EXPERIMENT Interim Report
R. B. Cooper, K. L. Marino, and W. R. Bertsche Jul. 1981 122 p
(Grant DOT-CG-835285-A)
(AD-A106672; EA-81-U-009; USCG-D-50-81) Avail: NTIS HC A06/MF A01 CSCL 17/7

The report describes a ship's bridge simulation evaluation of an electronic radio aids to navigation display for use by pilots in restricted waterways. The experiment known as RA-2 is the third in a series of experiments to trade off display information effectiveness with operational requirements and shipboard system cost. The RA-2 evaluation used a 'benchmark' true motion, trackup GRAPHIC display recommended in the previous experiment to conduct simulated poor visibility runs of a 30,000 dwt tanker around a 35-degree left bend in a 500-foot-wide channel. Experimental variables included two different navigation system noise levels which translated to random position errors of 16 and 32 meters RMS, and the use of an ALPHA-BETA tracker with 3-, 12-, or 24-second rise time, or gyro aiding, to represent a state-of-the-art navigation system filtering capability. Evaluation criteria included pilot trackkeeping and maneuvering performance as well as system acceptance. The report describes the rationale for variable selection, how they were simulated, and their potential effect on restricted waterway pilotage when the 'benchmark' display is used. Author (GRA)

N82-16063# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ATCRBS UPLINK ENVIRONMENT MEASUREMENT NEAR JACKSONVILLE, FLORIDA
F. Nagy, Jr. 25 Sep. 1981 124 p
(Contracts F19638-80-C-0002; DOT-FA72WAI-261; FAA Proj. 052-241-04)
(AD-A108053; ATC-94; FAA-RD-80-70) Avail: NTIS HC A06/MF A01 CSCL 17/7

Airborne measurements of the Air Traffic Control Radar Beacon System (ATCRBS) 1030 MHz uplink environment are described. Measurements were made using the AMF, a special purpose airborne sensor-recorder, during a 23 May 1979 flight in the greater Jacksonville, Florida area. The 2-way flight covered the 450 nm coastline between Fayetteville (NC) and Vero Beach (FL) first at 10,000 then at 25,000 feet. Data recorded at 61 locations have been analyzed to plot combined pulse, interrogation and suppression rates for all locations and individual rates, received powers and angles for 37 locations. Fifty-nine ground interrogators were detected and a list included serves as an all-interrogator/all location (59 x 37) visibility matrix. PRI/PRF distributions of interrogations received are shown at three selected measurement locations. A pulse-by-pulse plot of over 50 Mode 4 interrogations shows their effect on a typical transponder. A worst location is examined for peak instantaneous interrogation rates capable of causing transponder reply-rate limiting (RRL), desensitization and track loss. Durations and periods of recurrence of synchronous jamming for 23 near-equal scan periods are computed. Probabilities or multiple mainbeam coincidences (multi-PRF jamming) are also calculated. Airborne (AMF) and ground based (FAA En-route) coverages are compared, and reported operational problems (target splits, lost tracks, poor coverage) are addressed. Author

N82-16064# Harry Diamond Labs., Adelphi, Md.
THE ZERO-DOPPLER POSITIONING SYSTEM
Wolfgang G. A. Wiebach and Barry L. Stann Sep. 1981 97 p refs

(DA Proj. 1G6-62707-A-576)
(AD-A107806; HDL-TR-1968) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report investigates a radio positioning system for forward artillery observers. The theoretical basis is derived, and implementation schemes are discussed. The preferred implementation is developed in detail and an experimental hardware model is described, giving performance specifications and circuit diagrams of the more important subassemblies. A program of simulated field tests of various degrees of complexity was carried out in the Washington, DC, area; their results are presented.
Author (GRA)

N82-16065# Coast Guard Research and Development Center, Groton, Conn.
ANALYTICAL POSITIONING OF AIDS TO NAVIGATION Final Report
Miles A. Millbach Nov. 1981 130 p refs
(AD-A107811; CGR/DC-5/81; USCG-D-22-81) Avail: NTIS HC A07/MF A01 CSCL 17/7

Sophisticated systems such as the Global Positioning System (GPS) and the Inertial Positioning System (IPS) are not yet economically justified for widespread Coast Guard use in positioning aids to navigation. To improve accuracy and precision in positioning until such systems are justified, alternative procedures have been explored. Accuracy and precision are addressed to create various mathematical, statistical and operational procedures immediately applicable to the Coast Guard. This adventure into marine geodesy can help the Coast Guard employ error minimizing positioning procedures until more precise methods and reliable techniques are available.
Author (GRA)

N82-16066# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
TIME CORRECTION OF DATA FROM THE NAVSTAR GEODETIC RECEIVER SYSTEM Final Report
Bruce R. Hermann Aug. 1981 75 p refs
(AD-A107643; NSWC/TR-81-174) Avail: NTIS HC A04/MF A01 CSCL 17/7

The NAVSTAR Global Positioning System (NGPS) can be used for geodetic applications. The NAVSTAR Geodetic Receiver System (NGRS) has been developed to demonstrate this capability. In order to use the pseudorange and Doppler observations to do precise point positioning, the time of each observation must be known in the GPS time system. The method used to convert local (NGRS) time to GPS time is described. Author (GRA)

N82-16067# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AIRCRAFT POSITION MEASUREMENT USING LASER BEACON OPTICS M.S. Thesis - Princeton Univ.
Steven G. Webb 1981 107 p refs
(AD-A107973; AFIT-CI-81-58T) Avail: NTIS HC A06/MF A01 CSCL 17/7

The development of a system to precisely measure the relative position between two aircraft in-flight utilizing a laser beacon, an optical detector array, and on-board microprocessing is examined. The laser beacon board, mounted on the helicopter, consists of two orthogonal fan-shaped narrow width beams, which rotate at a constant four revolutions per second and have fields of view approaching 166 degrees. The photodiode transmits the detected beams, as pulses, to an electronics system where they pass through a band-pass filter and are converted into digital pulses for signal processing. The laser pulses are detected in the presence of background solar interference through optical spectral filtering of the incident light and electronic filtering of the photodiode signal. Initial tests of the laser beacon and the detector optics have demonstrated the potential for their use as elements of a relative position measurement system. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-16068*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPIN TESTS OF A SINGLE-ENGINE, HIGH-WING LIGHT AIRPLANE
Eric C. Stewart, William T. Suit, Thomas M. Moul, and Philip W. Brown Jan. 1982 93 p refs
(NASA-TP-1927; L-14305) Avail: NTIS HC A05/MF A01 CSCL 01C

The airplane has a relatively steep spin mode (low angle of attack) with a high load factor and high velocity. The airplane recovers almost immediately after any deviation from the prospin control positions, except for one maneuver with reduced flexibility in the elevator control system. T.M.

N82-16069*# Nielsen Engineering and Research Inc., Mountain View, Calif.
INTEGRATION OF A CODE FOR AEROELASTIC DESIGN OF CONVENTIONAL AND COMPOSITE WINGS INTO ACSYNT, AN AIRCRAFT SYNTHESIS PROGRAM Final Report, 1972 - 1974
Joseph Mullen, Jr. Ames Research Center, Calif. NASA May 1976 143 p refs
(Contract NAS2-8558)
(NASA-CR-137805) Avail: NTIS HC A07/MF A01 CSCL 01C

A comparison of program estimates of wing weight, material distribution, structural loads and elastic deformations with actual Northrop F-5A/B data is presented. Correlation coefficients obtained using data from a number of existing aircraft were computed for use in vehicle synthesis to estimate wing weights. The modifications necessary to adapt the WADES code for use in the ACSYNT program are described. Basic program flow and overlay structure is outlined. An example of the convergence of the procedure in estimating wing weights during the synthesis of a vehicle to satisfy F-5 mission requirements is given. A description of inputs required for use of the WADES program is included. T.M.

N82-16070*# Lockheed-Georgia Co., Marietta.
TURBOPROP CARGO AIRCRAFT SYSTEMS STUDY
J. C. Muehlbauer, J. G. Hewell, Jr., S. P. Lindenbaum, C. C. Randall, N. Searle, and R. G. Stone, Jr. Nov. 1981 232 p refs
(Contract NAS1-15708)
(NASA-CR-165813; LG81ER0222) Avail: NTIS HC A11/MF A01 CSCL 01C

The effects of using advanced turboprop propulsion systems to reduce the fuel consumption and direct operating costs of cargo aircraft were studied, and the impact of these systems on aircraft noise and noise prints around a terminal area was determined. Parametric variations of aircraft and propeller characteristics were investigated to determine their effects on noiseprint areas, fuel consumption, and direct operating costs. From these results, three aircraft designs were selected and subjected to design refinements and sensitivity analyses. Three competitive turbofan aircraft were also defined from parametric studies to provide a basis for comparing the two types of propulsion. S.L.

N82-16071# Aeronautical Research Labs., Melbourne (Australia).
RESONANCE TESTS ON A PIPER PA-32R TAILPLANE BEFORE AND AFTER DAMAGE Technical Memo, Feb. - Jul. 1980
A. Goldman and B. Quinn Apr. 1981 16 p ref
(AD-A106273; ARL/STRUC-TM-328) Avail: NTIS HC A02/MF A01 CSCL 01/3

Investigations have been carried out, on the tailplane of a Piper PA-32R aircraft, to determine the effect of damage, in the form of a split in the underside skin, on the modes of

vibration of the tailplane. Details and results of the investigations are described. Author (GRA)

N82-16072# Rockwell International Corp., El Segundo, Calif. Aircraft Div.
CONFIGURATION DEVELOPMENT SYSTEM/NAVAIR REPORT Final Report
Daniel Paul Raymer 26 May 1981 8 p
(Contract N00019-80-C-0489)
(AD-A106727; NA-81-290) Avail: NTIS HC A02/MF A01 CSCL 01/3

A fixed price level of effort was performed to install Rockwell's Configuration Development System (CDS) at the Naval Air Systems Command (NAVAIR) facility in Washington, D.C. (Crystal City). Installation of CDS permits NAVAIR the capability to conceptually design aircraft concepts on an interactive graphics terminal and also perform conceptual analysis and concept iteration. Under the contract, the CDS system was converted to run on a VAX 11-780 computer. Program modifications were implemented to allow a greater degree of device-independence, especially for terminal input/output. Also, the CDS program was tested and debugged, the command interpreter was improved, and some additional capabilities were developed. The manual was rewritten including the addition of training materials for classroom and hands-on instruction. Finally, the system was installed and users were trained. Author (GRA)

N82-16073# Aeronautical Research Labs., Melbourne (Australia).
GROUND CALIBRATION OF A STRAIN-GAUGED CT-4A AIRCRAFT (1979)
R. P. Carey and S. P. Costolloe Apr. 1981 53 p refs
(AD-A107847; ARL/SRUC-TM-330) Avail: NTIS HC A04/MF A01 CSCL 01/3

A strain gauged CT-4A aircraft was calibrated for external loadings as a supplement to flight testing. The loading has been described and the outputs from regression analyses on the strain/load data have been tabulated. Author (GRA)

N82-16074# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
ICE PHOBICS BLADE TRACKING AND COMPARISON OF VIBRATION ANALYSIS TECHNIQUES Final Report, Jun. 1979 - Mar. 1980
William Y. Abbott, Floyd I. Dominick, and Stuart Arthur May 1981 64 p refs
(AD-A108121; USAAEFA-79-86) Avail: NTIS HC A04/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted an evaluation of two vibration measuring devices, the Chadwick-Helmuth VIBREX and the Scientific-Atlanta Vibration Signature Recorder, as flight test instrumentation. During the course of those evaluations, it was determined that the Dow Corning E2460-40-1 (redesignated E2978-46) ice phobic coating applied to the rotor blades of a UH-1H helicopter, did not induce undesirable vibrations. It was also concluded that the VIBREX may be used as test instrumentation if the frequencies of interest are already known, and the Scientific-Atlanta device provides good 'quick look' spectral vibration data. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-16075*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SYSTEM FOR PROVIDING AN INTEGRATED DISPLAY OF INSTANTANEOUS INFORMATION RELATIVE TO AIRCRAFT ATTITUDE, HEADING, ALTITUDE, AND HORIZONTAL SITUATION Patent
Robert James, inventor (to NASA) (James and Associates, Lancaster, Calif.) Issued 11 Aug. 1981 19 p Filed 30 May 1979 Supersedes N79-24988 (17 - 16, p 2074) Sponsored by NASA
(NASA-Case-FRC-11005-1; US-Patent-4,283,705; US-Patent-Appl-SN-043942; US-Patent-Class-340-27NA; US-Patent-Class-73-178R) Avail: US Patent and Trademark Office CSCL 01D

A display device is disclosed which is particularly suited for providing the pilot of an aircraft with combined inflight altitude, heading, altitude, and horizontal situation information previously available only by using two or three devices providing separate displays. The preferred embodiment combines a commonly used and commercially available flight director-type device for providing a display in combination with a miniature aircraft supported for angular displacement from a vertical orientation to indicate heading error, or heading offset, and an extended course deviation indicator bar which projects into juxtaposition with the miniature aircraft for providing a true picture of the aircraft's horizontal situation relative to a selective VOR, ILS, or MLS course.
Official Gazette of the U.S. Patent and Trademark Office

N82-16076*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THREAT PERCEPTION WHILE VIEWING SINGLE INTRUDER CONFLICTS ON A COCKPIT DISPLAY OF TRAFFIC INFORMATION
Stephen R. Ellis and Everett Palmer Jan. 1982 17 p refs
(NASA-TM-81341; A-8798) Avail: NTIS HC A02/MF A01 CSCL 01D

Subjective estimates of the threat posed by a single intruder aircraft were determined by showing pilots photographs of a cockpit display of traffic information. The time the intruder was away from the point of minimum separation was found to be the major determinant of the perception of threat. When asked to choose a maneuver to reduce the conflict, pilots selected maneuvers with a bias toward those that would have kept the intruders in sight had they been visible out the cockpit window.
Author

N82-16077# Boeing Commercial Airplane Co., Seattle, Wash.
AIRCRAFT ALERTING SYSTEMS STANDARDIZATION STUDY. VOLUME 2: AIRCRAFT ALERTING SYSTEM DESIGN GUIDELINES Final Report
B. L. Berson, D. A. Po-Chedley, G. P. Boucek, D. C. Hanson, M. F. Leffler, and R. L. Wasson Jan. 1981 186 p refs
(Contract DOT-FA79WA-4268)
(AD-A106732; D6-49976TN; FAA-RD-81-38-vol-2) Avail: NTIS HC A09/MF A01 CSCL 01/4

This report is one of a series of documented studies directed to the improvement and standardization of aircraft alerting systems. The purpose of the study was to develop and validate, through simulation, functional design criteria that can be used in designing effective aircraft alerting systems. The major objectives of this phase of the study were to: resolve system component questions; validate the two candidate system/concepts by comparison to a representative baseline system, for both the pilot and flight engineer stations; evaluate presentation media and display formats for time-critical warnings; and develop guidelines for the design of alerting systems. This document presents a set of design guidelines directed to the improvement and standardization of aircraft alerting systems. The objective of the guidelines is not to define a simple hardware design that each manufacturer must use, but rather to provide functional design criteria that can be used to develop effective alerting systems, and to promote standardization within the industry.
GRA

N82-16078# Simula, Inc., Tempe, Ariz.
OPERATOR'S MANUAL FOR VARIABLE WEIGHT, VARIABLE CG HELMET SIMULATOR
Craig M. Svoboda and James C. Warrick Fort Rucker, Ala. Army Aeromedical Research Lab. Sep. 1981 29 p Prepared for Wright State Univ.
(Contract DAMD17-80-C-0089)
(AD-A108093; USAARL-81-7) Avail: NTIS HC A03/MF A01 CSCL 05/5

A variable weight, variable CG helmet simulator has been designed to measure the effect of US Army headgear on muscle loading and fatigue. The helmet simulator consists of two weight concealment boxes attached to opposite sides of a supporting head which in turn is mounted on the wearer's head by a

suspension system taken from an SPH-4 helmet. The weight and CG can be altered by positioning variable weights within the concealment boxes. Author (GRA)

N82-16079# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DIGITAL AVIONICS INFORMATION SYSTEM (DAIS): DEVELOPMENT AND DEMONSTRATION Final Report, 1 Oct. 1978 - 31 Jul. 1981
M. J. Cook, R. C. Mason, J. L. Stautberg, L. E. Self, R. L. Ellison, and M. J. Strathman Wright-Patterson AFB, Ohio AFWAL Sep. 1981 201 p
(Contract F33615-78-C-1502; AF Proj. 2052)
(AD-A107906; AFWAL-TR-81-1165) Avail: NTIS HC A10/MF A01 CSCL 09/2

The Digital Avionics Information System (DAIS) represents a significant advance in the technology of avionics system architecture. DAIS is a total systems concept, exploiting standardization, modularity, and application independent executive software to provide a system architecture adaptable to many aircraft, missions, and avionics configurations and fully capable of accommodating new advances in technology. These fundamental system characteristics are described in this report; the specific system features which provide these characteristics and attributes are presented. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-16080*# United Technologies Research Center, East Hartford, Conn.
RESEARCH AND DEVELOPMENT PROGRAM FOR NON-LINEAR STRUCTURAL MODELING WITH ADVANCED TIME-TEMPERATURE DEPENDENT CONSTITUTIVE RELATIONSHIPS Final Report
Kevin P. Walker 25 Nov. 1981 187 p refs
(Contract NAS3-22055)
(NASA-CR-165533; PWA-5700-50) Avail: NTIS HC A09/MF A01 CSCL 21E

Results of a 20-month research and development program for nonlinear structural modeling with advanced time-temperature constitutive relationships are reported. The program included: (1) the evaluation of a number of viscoplastic constitutive models in the published literature; (2) incorporation of three of the most appropriate constitutive models into the MARC nonlinear finite element program; (3) calibration of the three constitutive models against experimental data using Hastelloy-X material; and (4) application of the most appropriate constitutive model to a three dimensional finite element analysis of a cylindrical combustor liner louver test specimen to establish the capability of the viscoplastic model to predict component structural response. M.D.K.

N82-16081*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
STUDY OF CONTROLLED DIFFUSION STATOR BLADING. 1. AERODYNAMIC AND MECHANICAL DESIGN REPORT
E. Canal, B. C. Chisholm, D. Lee, and D. A. Spear Jan. 1981 97 p refs
(Contract NAS3-22008)
(NASA-CR-165500; PWA-5698-28) Avail: NTIS HC A05/MF A01 CSCL 21E

Pratt & Whitney Aircraft is conducting a test program for NASA in order to demonstrate that a controlled-diffusion stator provides low losses at high loadings and Mach numbers. The technology has shown great promise in wind tunnel tests. Details of the design of the controlled diffusion stator vanes and the multiple-circular-arc rotor blades are presented. The stage, including stator and rotor, was designed to be suitable for the first-stage of an advanced multistage, high-pressure compressor. Author

N82-16082*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
A COMPUTER CODE FOR SWIRLING TURBULENT AXISYMMETRIC RECIRCULATING FLOWS IN PRACTICAL ISOTHERMAL COMBUSTOR GEOMETRIES Final Report
D. G. Lilley and D. L. Rhode Washington NASA Feb. 1982 134 p refs
(Grant NAG3-74)
(NASA-CR-3442) Avail: NTIS HC A07/MF A01 CSCL 21E

A primitive pressure-velocity variable finite difference computer code was developed to predict swirling recirculating inert turbulent flows in axisymmetric combustors in general, and for application to a specific idealized combustion chamber with sudden or gradual expansion. The technique involves a staggered grid system for axial and radial velocities, a line relaxation procedure for efficient solution of the equations, a two-equation k-epsilon turbulence model, a stairstep boundary representation of the expansion flow, and realistic accommodation of swirl effects. A user's manual, dealing with the computational problem, showing how the mathematical basis and computational scheme may be translated into a computer program is presented. A flow chart, FORTRAN IV listing, notes about various subroutines and a user's guide are supplied as an aid to prospective users of the code. Author

N82-16083*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
COMPARISON OF ACOUSTIC DATA FROM A 102 MM CONIC NOZZLE AS MEASURED IN THE RAE 24-FOOT WIND TUNNEL AND THE NASA AMES 40- BY 80-FOOT WIND TUNNEL
A. Atencio, Jr. and J. McKie (Royal Aircraft Establishment, England) Jan. 1982 23 p refs
(NASA-TM-81343; A-8801) Avail: NTIS HC A02/MF A01 CSCL 21E

A cooperative program between the Royal Aircraft Establishment (RAE), England, and the NASA Ames Research Center was initiated to compare acoustic measurements made in the RAE 24-foot wind tunnel and in the Ames 40- by 80-foot wind tunnel. The acoustic measurements were made in both facilities using the same 102 mm conical nozzle supplied by the RAE. The nozzle was tested by each organization using its respective jet test rig. The mounting hardware and nozzle exit conditions were matched as closely as possible. The data from each wind tunnel were independently analyzed by the respective organization. The results from these tests show good agreement. In both facilities, interference with acoustic measurement is evident at angles in the forward quadrant. Author

N82-16084*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
NASA RESEARCH ACTIVITIES IN AEROPROPULSION
John F. McCarthy, Jr. and Richard J. Weber 1982 30 p refs Presented at the 24th Ann. Conf. on Aviation and Astronautics, Tel Aviv, Israel, 17-18 Feb. 1982
(NASA-TM-82788; E-1113) Avail: NTIS HC A03/MF A01 CSCL 21E

NASA is responsible for advancing technologies related to air transportation. A sampling of the work at NASA's Lewis Research Center aimed at improved aircraft propulsion systems is described. Particularly stressed are efforts related to reduced noise and fuel consumption of subsonic transports. Generic work in specific disciplines are reviewed including computational analysis, materials, structures, controls, diagnostics, alternative fuels, and high-speed propellers. Prospects for variable cycle engines are also discussed. Author

N82-16085# Ford Motor Co., Dearborn, Mich.
BRITTLE MATERIALS DESIGN, HIGH TEMPERATURE GAS TURBINE Final Report, 1 Jul. 1971 - 31 Aug. 1979
Arthur F. McLean and Eugene A. Fisher Mar. 1981 232 p refs
(Contract DAAG46-71-C-0162; DARPA Order 1849)
(AD-A106670; AMMRC-TR-81-14) Avail: NTIS HC A11/MF A01 CSCL 21/5

A goal of 200 hours of engine rig demonstrations for representative duty cycle temperatures in a regenerated vehicular gas turbine was chosen, with uncooled ceramic components to operate at least 25 hours at 2500 F, beyond the temperatures possible with uncooled metal components. The total systems approach included major efforts in ceramic design, materials development, fabrication process development, and test and evaluation methodology. Progress was made in each of these areas during the course of the program. For example, the strength of reaction bonded silicon nitride (RBSN) used in the stator and rotor blades was more than tripled. By the end of the program, 200 hours of duty cycle durability on turbine test rigs (between 1930 F - 2500 F) was attained on RBSN stationary components including stators, nose cones and turbine rotor tip shrouds. Similarly, 200 hours of duty cycling on test rigs was attained with reaction sintered SiC combustors and stators. GRA

N82-16086# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Turbine Engine Div.

A COMPUTER PROGRAM FOR VARIABLE-GEOMETRY SINGLE-STAGE AXIAL COMPRESSOR TEST DATA ANALYSIS (UD0400) Interim Report, 1 Jun. 1980 - 31 May 1981

C. Herbert Law Sep. 1981 147 p refs
(AF Proj. 2307)
(AD-A106676; AFWAL-TR-81-2078) Avail: NTIS HC A07/MF A01 CSCL 21/5

This report describes a computer program that is designed for the analysis of single-stage axial compressor data. The axisymmetric flow of a thermally perfect compressible fluid is assumed, and the streamline curvature method of solution is employed. Details of the blade geometry may be computed or input, and a detailed account of the flow through the blading may be obtained. The analysis is limited to a single-stage compressor, but inlet guide vanes may be included. Variable geometry is permitted in both the inlet guide vanes and the stator vanes. An option in the analysis is to match computed and experimental static pressures at any radius by varying annulus blockage or relative flow deviation angles. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-16087*# Analytical Mechanics Associates, Inc., Mountain View, Calif.

AN INVESTIGATION OF AUTOMATIC GUIDANCE CONCEPTS TO STEER A VTOL AIRCRAFT TO A SMALL AVIATION FACILITY SHIP

J. A. Sorensen, T. Goka, A. V. Phatak, and S. F. Schmidt Jul. 1980 253 p refs
(Contract NAS2-10288)
(NASA-CR-152407) Avail: NTIS HC A12/MF A01 CSCL 01C

A detailed system model of a VTOL aircraft approaching a small aviation facility ship was developed and used to investigate several approach guidance concepts. A preliminary analysis of the aircraft-vessel landing guidance requirements was conducted. The various subelements and constraints of the flight system are described including the landing scenario, lift fan aircraft, state rate feedback flight control, MLS-based navigation, sea state induced ship motion, and wake turbulence due to wind-over-deck effects. These elements are integrated into a systems model with various guidance concepts. Guidance is described in terms of lateral, vertical, and longitudinal axes steering modes and approach and landing phases divided by a nominal hover (or stationkeeping) point defined with respect to the landing pad. The approach guidance methods are evaluated, and the two better steering concepts are studied by both single pass and Monte Carlo statistical simulation runs. Four different guidance concepts are defined for further analysis for the landing phase of flight. J.M.S.

N82-16088*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AUTOMATION OF ON-BOARD FLIGHTPATH MANAGEMENT

Heinz Erzberger Dec. 1981 22 p refs
(NASA-TM-84212; A-8809) Avail: NTIS HC A02/MF A01 CSCL 07C

The status of concepts and techniques for the design of onboard flight path management systems is reviewed. Such systems are designed to increase flight efficiency and safety by automating the optimization of flight procedures onboard aircraft. After a brief review of the origins and functions of such systems, two complementary methods are described for attacking the key design problem, namely, the synthesis of efficient trajectories. One method optimizes en route, the other optimizes terminal area flight; both methods are rooted in optimal control theory. Simulation and flight test results are reviewed to illustrate the potential of these systems for fuel and cost savings. J.M.S.

N82-16089*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.

A PROGRAM TO EVALUATE A CONTROL SYSTEM BASED ON FEEDBACK OF AERODYNAMIC PRESSURE DIFFERENTIALS Final Report

David W. Levy, Paul Finn, and Jan Roskam Dec. 1981 205 p refs
(Grant NAG4-5)
(NASA-CR-163466; KU-FRL-490-2) Avail: NTIS HC A10/MF A01 CSCL 01C

The use of aerodynamic pressure differentials to position a control surface is evaluated. The system is a differential pressure command loop, analogous to a position command loop, where the surface is commanded to move until a desired differential pressure across the surface is achieved. This type of control is more direct and accurate because it is the differential pressure which causes the control forces and moments. A frequency response test was performed in a low speed wind tunnel to measure the performance of the system. Both pressure and position feedback were tested. The pressure feedback performed as well as position feedback implying that the actuator, with a break frequency on the order of 10 Rad/sec, was the limiting component. Theoretical considerations indicate that aerodynamic lags will not appear below frequencies of 50 Rad/sec, or higher. S.L.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-16090*# Goodyear Aerospace Corp., Akron, Ohio.

STUDY OF GROUND HANDLING CHARACTERISTICS OF A MARITIME PATROL AIRSHIP Contractor Final Report, Oct. 1980 - Mar. 1981

Mar. 1981 280 p refs
(Contract NAS2-10448)
(NASA-CR-166253; GER-16948) Avail: NTIS HC A13/MF A01 CSCL 01E

Mooring concepts appropriate for maritime patrol airship (MPA) vehicles are investigated. The evolution of ground handling systems and procedures for all airship types is reviewed to ensure that appropriate consideration is given to past experiences. A tri-rotor maritime patrol airship is identified and described. Wind loads on a moored airship and the effects of these loads on vehicle design are analyzed. Several mooring concepts are assessed with respect to the airship design, wind loads, and mooring site considerations. Basing requirements and applicability of expeditionary mooring also are addressed. Author

N82-16091*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CALIBRATION OF THE AMES ANECHOIC FACILITY. PHASE 1: SHORT RANGE PLAN Final Report, Dec. 1980
David Hickey, Paul T. Soderman, K. Karamcheti, S. P. Koutsoyannis, R. Hopkins, and B. McLachlan Dec. 1980 129 p refs
Prepared in cooperation with Stanford Univ., Calif.
(NASA-TM-84081) Avail: NTIS HC A07/MF A01 CSCL 14B

A calibration was made of the acoustic and aerodynamic characteristics of a small, open-jet wind tunnel in an anechoic room. The jet nozzle was 102 mm diameter and was operated subsonically. The anechoic-room dimensions were 7.6 m by 5.5 m by 3.4 m high (wedge tip to wedge tip). Noise contours in the chamber were determined by various jet speeds and exhaust collector positions. The optimum nozzle/collector separation from an acoustic standpoint was 2.1 m. Jet velocity profiles and turbulence levels were measured using pressure probes and hot wires. The jet was found to be symmetric, with no unusual characteristics. The turbulence measurements were hampered by oil mist contamination of the airflow. Author

N82-16092*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH THROUGH SIMULATION
James L. Copeland, comp. [1982] 30 p refs
(NASA-Facts-125) Avai NTIS HC A03/MF A01 CSCL 14B

The design of the computer operating system at Langley Research Center allows for concurrent support of time-critical simulations and background analytical computing on the same machine. Signal path interconnections between computing hardware and flight simulation hardware is provided to allow up to six simulation programs to be in operation at one time. Capabilities and research applications are discussed for the: (1) differential maneuvering simulator; (2) visual motion simulator; (3) terminal configured vehicle simulator; (4) general aviation aircraft simulator; (5) general purpose fixed based simulator; (6) transport simulator; (7) digital fly by wire simulator; (8) general purpose fighter simulator; and (9) the roll-up cockpit. The visual landing display system and graphics display system are described and their simulator support applications are listed. A.R.H.

N82-16093# Southwest Research Inst., San Antonio, Tex. Mobile Energy Div.
DEVELOPMENT OF THE AUTOMATED AFAPL ENGINE SIMULATOR TEST FOR LUBRICANT EVALUATION Final Technical Report, 1 May 1978 - 1 Jan. 1981
B. B. Baber, M. L. Valtierra, and J. E. Eichelberger Wright-Patterson AFB, Ohio AFWAL May 1981 104 p refs
(Contract F33615-78-C-2012; AF Proj. 3048)
(AD-A106128; SWRI-MED-119; AFWAL-TR-81-2022) Avail: NTIS HC A06/MF A01 CSCL 14/2

A description of an automated gas turbine engine simulator, designated the AFAPL engine simulator, and a discussion of the test results obtained using the simulator are presented. The No. 4-5 bearing compartment areas of a J57 turbine engine are used as the basic hardware for the simulator. The simulator is driven by a variable-speed drive system, through the accessory drive gearbox, providing simulator mainshaft speeds up to 10,000 rpm. Electrical resistance heaters are used to heat the air surrounding the oil-wetted areas within the No. 4-5 bearing compartment areas. The temperatures, pressures, and rpm are automatically controlled at predetermined levels and monitored throughout the 9120-6000 rpm speed cycling sequences and the soakback periods by a Hewlett-Packard mini-computer system, which is also programmed to automatically draw 5-hr interval test-oil samples, control test-oil sump level, provide safety shut-off protection, as well as print out and plot test information generated during each individual test. Simulator results obtained on eight turbine engine lubricants, for which full-scale engine data are available, show a very good correlation of the deposit ratings obtained using the AFAPL engine simulator and the deposit ratings from full-scale engine tests. Author (GRA)

N82-16094# Florida Inst. of Tech., Melbourne. Dept. of Electrical and Computer Engineering.
IMPLEMENTATION OF THE RECOMMENDATIONS MADE ON THE TECHNICAL REPORT TITLED ANALYSIS OF ADVANCED SIMULATOR FOR PILOT TRAINING Final Report
John Hadjilogiou Jun. 1981 111 p
(Grant AF-AFOSR-0120-81; AF Proj. 2313)
(AD-A106779; AFOSR-81-0704TR) Avail: NTIS HC A06/MF A01 CSCL 14/2

This study which was conducted to implement some of the recommendations made on the technical report titled 'Analysis of Advanced Simulator for Pilot Training'. The final report specify guidelines for writing custom micro-programs routine for the 32/75 computer. It includes the hardware feature of the digital system with special emphasis on micro-program control section. The micro-instruction format is analyzed in detail to allow the reader to follow the example of the SEL report reproduced on the Appendices. GRA

N82-16095# Aeronautical Research Labs., Melbourne (Australia).
PROGRAMS FOR THE TRANSONIC WIND TUNNEL DATA PROCESSING INSTALLATION. PART 9: PRESSURE MEASUREMENTS UPDATED
J. B. Willis May 1981 16 p refs
(AD-A106271; ARL/AERO-TM-329) Avail: NTIS HC A02/MF A01 CSCL 09/2

It is now ten years since the original pressure measurement program for the transonic wind tunnel PDP 8/I data processing installation was written. During this period considerable changes have been made, and this memorandum describes the current program. Author (GRA)

N82-16096# Aeronautical Research Labs., Melbourne (Australia).
CURRENT PRESSURE MEASURING SYSTEM IN THE TRANSONIC WIND TUNNEL
J. B. Willis May 1981 16 p ref
(AD-A106272; ARL/AERO-TM-328) Avail: NTIS HC A02/MF A01 CSCL 14/2

A simple system for wind tunnel pressure measurements is described. It is intended for use with Scanivalves, a minicomputer and stagger scans at a preset, variable rate. The scan may be started and stopped under program control, and all Scanivalves are automatically homed at the end of the computer initiated scan. Scanivalve number, port number, and four digits representing the measured pressure are displayed and provided for the minicomputer. Author (GRA)

N82-16097# Aeronautical Research Labs., Melbourne (Australia).
A VERSATILE DATA ACQUISITION SYSTEM FOR A LOW SPEED WIND TUNNEL
W. F. L. Sear, C. W. Sutton, and J. F. Harvey Nov. 1980 54 p
(AD-A106269; ARL/AERO-155; AR-002-248) Copyright. Avail: Issuing Activity CSCL 14/2

A data acquisition system for the Aeronautical Research Laboratories Low Speed Wind Tunnel is described. The system is versatile and simple to operate. Illuminated press button switches connect selected data sources with the addresses automatically generated within the system. Provision also exists for external addressing by a dedicated minicomputer.
Author (GRA)

N82-16098# McDonnell-Douglas Corp., St. Louis, Mo. Arc Heater Lab.
ARC CONTROL EXPERIMENTS USING A HIGH PERFORMANCE ARC HEATER Final Report, 1 Sep. 1980 - 30 Jun. 1981
J. H. Painter Arnold Air Force Station, Tenn. AEDC Oct. 1981 80 p refs
(Contract F40600-80-C-0005)
(AD-A106140; AEDC-TR-81-20) Avail: NTIS HC A05/MF A01 CSCL 14/2

Arc control parameters varied in these experiments were: arc current, arc pressure, air flow rate, starting ramp rate, arc polarity, component resistance to ground, spin coil current, and gas injection distribution. Geometric parameters varied were: nozzle throat area, constrictor length, and gas injection radius. Arc characteristics were documented on high-speed motion picture film at rates to 10,800 frames per second and by oscillograph. Analysis of these data indicated all of the parameters investigated had an effect on arc behavior and these effects are documented herein. The role of gas circulation and internal magnetic fields dominated other variations of the control

parameters. Reduction of the nozzle throat area by a factor of two had a strong influence on the circulation level and arc instabilities resulted. Intersegment arcing was photographed at high frame rates as were other arc instabilities such as blow-through, roll-over, and kinking. Methods of improving the arc control and stability were identified and evaluated within the scope of the program. A total of 50 arc heater tests were made at arc currents to 830 A and pressures to 50 atm. GRA

N82-16099# Tactical Air Warfare Center, Eglin AFB, Fla.
QOT AND E OF THE F-16 20MM AMMUNITION LOADING SYSTEM'S ABILITY TO UPLOAD/DOWNLOAD A-7D AIRCRAFT Final Report
27 Oct. 1981 8 p
(AD-A108007) Avail: NTIS HC A02/MF A01 CSCL 19/1

The purpose of this qualification operational test and evaluation (QOT and E) was to evaluate the ability of the F-16 20mm ALS to upload/download A-7D aircraft. Testing included uploading/downloading of 20mm ammunition on A-7D aircraft during normal day-to-day operations and during simulated combat conditions. A portion of the test was conducted with load crews wearing chemical warfare defense ensembles (CWDE). Specific Objectives are: Operational Effectiveness - to assess the capability of the F-16 ALS to upload/download ammunition into/from the A-7D aircraft; to assess the interoperability of the ALS with both the A-7D gun system and the modified replenisher, and to assess the capability of the modified replenisher to replenish the loader. Operational Suitability - Specific suitability objectives were not evaluated during this test. On site observations of some suitability areas (equipment failures, technical data, human factors, and chemical defense) were performed. GRA

N82-16100# Transportation Research Board, Washington, D.C. Commission on Sociotechnical Systems.
AIR SERVICE, AIRPORT ACCESS AND FUTURE TECHNOLOGY
Samuel Ewer Eastman, Frank LaMagna, Edward M. Whitlock, Mark Gorstein, and Richard Tilles 1981 60 p refs
(PB82-105958; TRB/TRR-803; ISBN-0-309-03717-2; ISSN-0361-1981; LC-81-14158) Avail: NTIS HC A04/MF A01; paper copy also available from Transportation Research Board, 2101 Constitution Ave., NW, Washington, D.C. 20418 CSCL 01B

Contents: (1) economic regulation of air service to small communities: origins of Airline Deregulation Act of 1978; (2) response to terminal access problems at American and United Airlines--John F. Kennedy International Airport; (3) automating the delivery of ground transportation information; (4) airport access--case study of a remote terminal operation; (5) airport geometric compatibility of future aircraft; (6) flight simulators; (7) gravitational-cueing system--an enhancement of aircraft flight simulation; and (8) laser system for visual simulation. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-16101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Sep. and Oct. 1981
N. A. Renzetti, ed. 15 Dec. 1981 370 p refs
(NASA-CR-165111; JPL-TDA-PR-42-66) Avail: NTIS HC A16/MF A01 CSCL 22A

Deep Space Network operations, engineering, and implementation are reported. Developments in Earth-based radiotechnology as applied to other research programs in the fields of Geodynamics, Astrophysics, and programs related to radio searchers (instrumentation and methods) in extraterrestrial areas in the microwave region of the electromagnetic spectrum are also presented. For individual titles, see N82-16102 through N82-16139.

N82-16102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIO ASTRONOMY c89
R. D. Shaffer, G. S. Levy, H. C. Wilck, M. J. Grimm, S. Gulkis, T. B. Kuiper, and E. T. Olsen *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 1-3 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 03A

Activities of the Deep Space Network (DSN) 26-, 34-, and 64 meter antenna stations in support of Radio Astronomy Operations are reported. Systems support was given for: (1) Pulsar Rotation Constancy and Planetary Radio Astronomy, (2) the Radio Frequency Interference Surveillance System, and (3) observation of astronomical sources and spacecraft. M.D.K.

N82-16103*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROPER FREQUENCIES OF A DOWN-LOOKING WATER-VAPOR RADIOMETER OVER SEA SURFACE c35
S. C. Wu *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 4-14 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

Altimeter observation on board an Earth-orbiting satellite over sea surface is corrupted by the water vapor path delay. Such error can be calibrated for by a down-looking microwave radiometer. The effects of water vapor profile, sea surface temperature, wind speed and brightness temperature measurment error on the calibration precision were studied. Proper frequency combinations were also searched to minimize these effects. The analysis indicates that it is possible to achieve a subcentimeter estimate of water vapor path delay on nadir observation with an on-board microwave radiometer. M.D.K.

N82-16104*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BLOCK 1 PHASE 2 VERY LONG BASELINE INTERFEROMETRY IMPLEMENTATION c14
J. H. Wilcher *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 15-18 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

A status report on the implementation of the Block I VLBI System (Very Long Baseline Interferometry), a phased implementation in the Deep Space Network, is presented. Systems testing, data correlation and postcorrelation, and personnel training are discussed. Block diagrams of the Ground Communication Facility and Network Operations, Control Center configuration, and DSS (Deep Space Station) configuration are given. M.D.K.

N82-16105*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DSN PROGRAMMING SYSTEM c61
G. A. Madrid *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 19-23 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09B

The DSN (Deep Space Network) programming system, its objectives, accomplishments, current status and plans is discussed. The basic structure of the DSN programming system is categorized and defined for these areas: (1) Software Standard Practices, (2) Standard Processors, (3) programming system data base, ((4) management aids, and (5) implementation aids. A need to review the design and structure of the current system is suggested. M.D.K.

N82-16106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT, 1 c14
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 24-26 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

A Deep Space Network report on tracking and data acquisition for Project Voyager for the period July through 11 August 1981 is presented. Deep Space Station 43 Radio Science capabilities as assessed by operational readiness and operational verification tests are described. Systems support for spacecraft trajectory correction maneuvers, navigation cycles, and horizontal and vertical scan maneuvers is described. Software and hardware improvements and implementations are also discussed. M.D.K.

N82-16107*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT, 2 **c14**
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 27-29 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

Deep Space Network tracking and data acquisition support for Project Voyager, 12 August through September 1981 is described. Support for Voyager 1 and Voyager 2 observations of Saturn, its ring system, and satellite Phoebe are reported. Systems support for pre-Saturn encounter and near encounter operations and spacecraft acquisition of medium-band occultation data and trajectory corrections are also discussed. M.D.K.

N82-16108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A VLBI SURVEY OF THE NORTHERN POLAR CAP REGION **c46**
D. D. Morabito, R. A. Preston, and J. Faulkner *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 30-36 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 08E

A VLBI (Very Long Baseline Interferometry) survey at 2.29 GHz of the nothern polar cap region (declination > 69 deg) was conducted using a baseline consisting of the NASA Deep Space Network (DSN) sites at Goldstone, California and Madrid, Spain. The purpose of this survey was to identify sources in the northern polar cap region which possess milliarcsecond components. High declination VLBI sources provide valuable geometric coverage for determining the spin axis components of baselines. Out of 48 candidate sources selected from the Bonn 5-GHz survey, 42 were detected to have compact structure on the California/Spain baseline at the 2.29-GHz observing frequency. This polar survey is part of a more general VLBI sky survey.
Author

N82-16109*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARCSECOND POSITIONS FOR MILLIARSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOUCES. PART 1: 546 SOURCES **c93**
D. D. Morabito, R. A. Preston, M. A. Slade, and D. L. Jauncey (CSIRO, Sydney) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 37-48 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 03B

Very long Baseline Interferometry measurements at 2290 MHz on baselines of approximately 10 to the 4th power km between Deep Space Network stations were used to identify sources that are suitable for precision astrometric applications. The use of relatively crude time delay measurements along with fringe frequency measurements to determine the positions of the milliarcsecond nuclei in 546 extragalactic sources with accuracies of generally approximately 1' is described. The calculated positions of the sources and the corresponding uncertainties are presented and the positions are referenced to the equinox of 1950.0 and elliptical aberration terms are included so as to agree with past astronomical convention. The source positions and position uncertainties for sources which were multiply observed were estimated from a weighted average. The reliability of the determined positions was demonstrated by testing the repeatability of multiple observations on the same source and by position comparisons with more accurate radio catalogs. M.D.K.

N82-16110*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN FM/CW METHOD FOR THE MEASUREMENTS OF TIME DELAYS OF LARGE CASSEGRAIN ANTENNAS **c32**
T. Y. Otoshi *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 49-59 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

An FM/CW measurement technique which utilizes the time domain principle was developed to measure the time delays of large Cassegrain antennas. Measured primary path delays of 60 ns (or greater) typically agreed with calculated delays to within 3 ns. Multipath sources generated within the antenna optics region were identified. The FM/CW technique in conjuction with the horn-on-dish configuration proved to be the most rapid, convenient, and accurate method for calibrating absolute time delays for a large antenna. The FM/CW instrumentation was invaluable as a diagnostics tool and facilitated increased understanding of the mechanisms of multipath signal generation within the antenna optics media multipath signals that could be deleterious to accuracy of antenna time delay calibrations.
M.D.K.

N82-16111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN M-ARY COHERENT OPTICAL RECEIVER FOR THE FREE-SPACE CHANNEL **c74**
V. A. Vilnrotter *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 60-66 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20F

The free-space channel is an ideal medium for communicating by means of spatially and temporally coherent optical fields. The structure of a coherent optical receiver for M-ary signals is derived assuming Poisson detection statistics. Receiver performance is evaluated for an M-ary signal set consisting of orthogonal Walsh-functions under the assumption of high-intensity symbol counts. The asymptotic performance bound is examined in the limit as both the dimension of the signal-set and the receiver bandwidth become arbitrarily large and it is shown that on the average a maximum of nearly three bits of information can be encoded onto each received photon using the above modulation scheme.
Author

N82-16112*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL MEASUREMENT TECHNIQUE OF RIB ELEMENTS ON DSN ANTENNA STRUCTURE **c32**
S. Glazer and G. Gale *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 67-79 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

An experimental test method for thermal measurement of antenna rib elements employing an imaging infrared radiometer is described. The ultimate goal is to use the dat in structural analysis codes to detemine the effects on dish deflection and RF performance. Basic radiometric theory is presented, along with a description of the test apparatus and current experimental test procedures. A sample set of antenna rib temperature using the developed methodology is also presented. J.D.H.

N82-16113*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
X-BAND NARROW-BEAM RADIOMETER FOR DSS 13 **c35**
M. M. Franco, S. D. Slobin, and C. T. Stelzried *In its* the Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 80-86 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

The design and testing of a narrow-beam X-band (8.44 GHz) radiometer is described. Continuous calibration is obtained by switching the receiver sequentially among the hot termination, ambient termination, and antenna noise positions. The measured antenna noise temperatures (10 second total integration time) have a standard deviation of about 0.4 K, which is in good agreement with theory. It is felt that radiometer performance is satisfactory for the purpose of making atmospheric noise temperature measurements. J.D.H.

N82-16114*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN OF A 1.5-m, 32-GHz, CLEAR APERTURE ANTENNA **c32**
A. Cha *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 87-93 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09C

Ground station antenna designs which have a clear aperture (no subreflector or strut blockage) and shaped reflector surfaces are described. The design of a 1.5-m, 32-GHz clear aperture

antenna model is discussed. Underlying considerations leading to the determination of the parameters defining the model antenna geometry are presented. J.D.H.

N82-16115*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

POWER EFFICIENCY OF SEMICONDUCTOR INJECTION LASERS c36

J. Katz *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 94-100 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20E

Analysis of a model of semiconductor injection lasers was carried out in terms of the basic parameters relevant to efficient device operations (i.e., device length, mirror reflectivity, absorption coefficient and material conductivity). The efficiency is improved as the optical absorption coefficient and the resistivity of the laser material are reduced. The maximum output intensity or the maximum photon density of the laser are specified; these parameters are constrained by reliability considerations. When all these are determined, there will exist a unique value of laser length and laser reflectivity which will optimize the laser efficiency for each application. It is important to note that all the device parameters must be adequately designed in order to optimize its overall power efficiency. N.W.

N82-16116*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHASE-LOCKING OF SEMICONDUCTOR INJECTION LASERS c36

J. Katz *In its* the Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 101-114 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20E

The problem of phase-locking of several semiconductor injection lasers via mutual coupling was investigated. The equations of motion of the parameters of both individual lasers and an array of lasers were derived considering both coupling via field overlapping and interactions via the active media. The solution of the equations was outlined and the conditions for obtaining phase-matching were derived. The sign of the coupling constraints must be negative, and its magnitude must be greater than the standard deviation of the laser transition frequency deviations. The actual magnitude of the coupling coefficients in several configurations were calculated, and the results indicate that is possible, although not trivial, to achieve the coupling conditions. N.W.

N82-16117*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE 2.5-BIT/DETECTED PHOTON DEMONSTRATION PROGRAM: DESCRIPTION, ANALYSIS AND PHASE 1 RESULTS c74

J. R. Lesh, J. Katz, H. H. Tan, and D. Zwillinger *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 115-132 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20F

An optical communications demonstration program designed to demonstrate 2.5 bits of information transfer per single detected photon is described. The program was divided into four demonstration phases representing increasing degrees of complexity. The theoretical analysis of each of the phases is presented where it is shown that the 2.5-bit/detected photon goal can be achieved. The experimental results of phase one, which are in excellent agreement with the theory, are also presented. N.W.

N82-16118*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DSS 13 UNATTENDED OPERATIONS STATION CONTROLLER Status Report c14

H. Cooper *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 133-137 (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 22D

A brief history of the unattended operations program is presented, followed by the status of the phase two station controller implementation. The unattended operations effort attempts to standardize on a minimum set of modules in order to reduce spares, and to develop a through understanding of the operation of the common modules used. The initial module selection consists of (1) BLC-80/204 single board computer, (2) BLC-064 64K RAM module, (3) BLC-8432 32K EPROM module, (4) BLC-8201 Floopy disk controller, (5) SBC-534 CH RS-232 module, (6) SBC-519 Parallel 1/0 module and (7) JPL-QSIA Jet Propulsion Lab designed interface module. N.W.

N82-16119*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A DIGITAL FILTER IMPLEMENTATION OF THE DEEP SPACE TRANSPONDER PHASE LOCK LOOP INTEGRATOR c33

J. W. Heller *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 138-147 ref (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09C

Having suffered in reliability due to malfunctioning capacitors, the phase lock loop integrating filter in the NASA standard deep space transponder is reconsidered. An alternative design, using a digital filter which eliminates these critical components is presented. The analog-to-digital conversion, digital filtering, and digital-to-analog conversion are all performed by an Intel 2920 digital signal processing integrated circuit. The circuit was tested for its step response and frequency response. The output for a 0.75 volt step input was recorded over a 3 hour period at 5 minute intervals and compared with the ideal response to the linear integrator. The maximum error was 1.5 percent. The filter was not tested in a loop. N.W.

N82-16120*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IMPROVED CARRIER TRACKING PERFORMANCE WITH COUPLED PHASE-LOCKED LOOPS c32

D. Divsalar and J. H. Yuen (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 148-171 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 17B

A carrier arraying system to combine the received carrier signals at geographically separated receivers with different carrier phases to improve carrier tracking performance is considered. This system basically couples several phase-locked loops to enhance received carrier signal-to-noise ratio. There is no extra alignment of carrier phases. This system automatically aligns the carrier phases, which results in coherent combining of the carrier signals. The tracking performance of this carrier arraying system are analyzed by assessing its rms phase jitter and radio loss. Carrier arraying alone will not provide any improvement in bit energy to noise spectral density ratio. However, carrier arraying provides reduction in radio loss with respect to the no carrier arraying case. Results were extended to the case of combined carrier and baseband arraying. Bit error rates and radio loss curves are given. Numerical results are given for three useful cases, namely, the array of 64/34, the array of 64/34/34 and the array of 64/34/34 meter-antenna stations of the NASA Deep Space Network. N.W.

N82-16121*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IMPLICATIONS OF THE PUTNAM SOFTWARE EQUATION ON CONFIDENCE LEVELS FOR PROJECT SUCCESS c61

R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 172-185 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09B

The implications of assumed powerlaw relationships among size, duration, and effort on the probability that a given software project will be completed within its estimated schedule and manpower resources are investigated. Software development tasks are treated as sample point in a probability space characterized by three random variables: size, duration, and resource expenditure. The completion confidence factor is then computed. The most astonishing conclusion is the low confidence factor of the average project, significantly less than 25%. This low confidence factor is the results of correlation of the project duration and work effort by a tradeoff relationship referred to as 'Putnam's software equation . N.W.

N82-16122*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GAIN UNCERTAINTY OF ARRAYED ANTENNAS c32
B. L. Seidel *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 186-190 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

It is shown that (1) the array gain increases as antennas are added to the array, (2) the error bars do not grow under the constraint that the performance of all elements is equally well known, and (3) the knowledge of the 64-meter antenna performance is more important to the array than knowledge of the 34-meter antennas and therefore, most effort should be spent quantifying the larger antenna. N.W.

N82-16123*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LIFE-CYCLE COST ANALYSIS OF PROJECTS USING A POLYNOMIAL CASH FLOW MODEL FOR NONUNIFORM MAINTENANCE AND OPERATIONS COSTS c83
D. S. Remer and G. Lorden (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 191-201 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05C

A mathematical model is developed for calculating the life-cycle costs for a project where the maintenance and operations (M&O) costs change in a nonlinear manner with time. Closed-form solutions are presented for computing the present worth of projects with periodic cash flow profiles that can be approximated by polynomial functions. The results show that the life-cycle cost for a project can be grossly underestimated (or overestimated) if the M&O costs increase or decrease nonuniformly over time rather than being constant or linear as is often assumed in project economic evaluations. The following range of variables is examined: (1) project life from 2 to 15 years, (2) interest rate from 0 to 30 percent per year, and (3) polynomials of order 0 to 5. Simplified solutions or the present worth are presented for two limiting cases: extented project lifetime and negligible interest rate. Also a simplified expression is provided for accurate present worth M&O estimates for DSN projects. In addition, a sensitivity analysis of the model based on graphical results and a numerical example plus tables and graphs are given to help the reader calculate M&O life-cycle costs over a wide range of variables. Author

N82-16124*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SINE WAVE RANGING REVISITED c32
A. I. Zygielbaum and A. Robinson *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 202-210 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

It has been conjectured that DSN ranging accuracy would be improved if the range code were a sine wave. Measurements are presented which demonstrate that this is not the case but that the use of sine waves may be worthwhile to conserve the uplink frequency spectrum. Author

N82-16125*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIO FREQUENCY INTERFERENCE BY EARTH ORBITING SATELLITES: DEEP SPACE INTERFERENCE PREDICTION PROGRAM c32
D. L. Cain and P. E. Beyer *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 211-213 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

The sensitivity requirements of the DSN Flight Projects make them quite susceptible to radio frequency interference. Efforts to predict this interference from Earth orbiting satellites are reported. Software development in the areas of trajectory computations and telecommunications analysis are discussed. J.M.S.

N82-16126*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEW S-BAND TRANSMITTER AUTOMATION SOFTWARE c61
W. Stahnke *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 214-218 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09B

The status of the 20-kW S-band transmitter automation project is reported. A software design using a simplified multitasking approach is described that will improve subsystem performance, maintainability, and extensibility. J.M.S.

N82-16127*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF PARTIAL COHERENCE IN RECEIVING SYSTEM NOISE TEMPERATURE ON ARRAY GAIN FOR TELEMETRY AND RADIO FREQUENCY CARRIER RECEPTION FOR SIMILAR RECEIVING SYSTEMS c32
M. H. Brockman *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 219-235 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 17B

The improvement of signal to noise ratios for arrayed receiving systems or stations when some portion of the predetection noise is coherent among the various receiving systems is examined. High-rate telemetry reception with residual radio frequency carrier arraying is addressed. The effect for arrayed receiving systems with essentially equal apertures, including the presence of a planet in the array beamwidth, is examined. J.D.H.

N82-16128*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPTIMUM EQUIPMENT MAINTENANCE/REPLACEMENT POLICY. PART 1: DYNAMIC PROGRAMMING APPROACH c81
T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 236-245 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05A

The optimization of equipment maintenance and/or replacement policy is considered. Over a given life-span of equipment, optimum policy is determined based on present costs, inflation rates, operating characteristics, future equipment developments, and other factors. A computer program utilizing the dynamic programming technique together with a numerical example is included. J.D.H.

N82-16129*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SYSTEM RELIABILITY ANALYSIS WITH DYNAMIC PROGRAMMING c38
T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 246-267 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09D

System reliability analysis using the Mission Success Diagram method is described. The basic building blocks and reliability prediction equations are presented. A BASIC computer program was written and tested with certain system configurations. This computer program can be modified for various system structures. J.D.H.

N82-16130*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPUTERIZED LIFE-CYCLE COST METHODOLOGY FOR ENGINEERING ANALYSIS c83
R. D. Hughes *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 268-287 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05C

Life-Cycle Costing (LCC) is an essential selection criterion in making economical engineering decisions about alternative routes in design or investments. A discussion of LCC concepts is presented, along with a selected calculation procedure. A computer program (LCOMP) was written in FORTRAN to perform that calculation procedure. The program details are discussed, a sample calculation is presented, and a listing of the program is included. Author

N82-16131*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

GCF-NOCC RECONFIGURATION **c14**

J. P. McClure *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 288-290 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 22D

The equipment and computer programs in the Network Operations Control Center (NOCC) and the Ground Communications Facility's (GCF's) Central Communication Terminal at the Jet Propulsion Laboratory were rearranged and supplemented to provide an improved operational capability. The reconfigured GCF-NOCC is described. J.D.H.

N82-16132*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ANTENNA AZIMUTH BEARING MODEL EXPERIMENT **c37**

H. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 291-306 ref (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 13I

The concluding description of the model test is presented. Reasons for expecting a long service life from a large-scale prototype are given. The bearing is of the wheel and track type and employs a novel suspension of the wheel. Various aspects of the design are discussed. J.D.H.

N82-16133*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OPERATIONAL VLBI CLOCK SYNCHRONIZATION AND PLATFORM PARAMETER DETERMINATION **c33**

J. V. LuValle, R. D. Shaffer, M. G. Roth, T. M. Eubanks, and P. S. Callahan *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 307-318 ref (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09C

The operation and results of the Block I Very Long Baseline Interferometry (VLBI) system for clock synchronization and platform parameter determination are described. The history of system performance from July 1980 to August 1981 is given. The steps in producing clock synchronization and platform parameters are outlined. It is shown that the VLBI data provide useful monitoring of the Deep Space Network frequency and timing System performance and Earth orientation. Author

N82-16134*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SYNTHESIZER STABILITY EVALUATION **c33**

E. N. Sosa and D. A. Tyner *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 319-330 ref (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09C

An accurate and simple technique for measuring rms phase noise as a function of integration time for offset frequencies (0.001 Hz) close to the carrier is described. The accuracy of this method is verified by Allan variance measurements in the time domain and through the use of Hadamard variance for generating high-resolution spectral density measurements. Two different synthesizers are evaluated and the results are presented. Author

N82-16135*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INVESTIGATION OF DIGITALLY CONTROLLED OSCILLATOR OPERABILITY PROBLEMS **c33**

W. D. Weisman *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 331-334 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09A

In order to provide adequate levels of flight project support, the elimination of procedural errors by Deep Space Network personnel is an important consideration. An investigation designed to identify and correct procedural error involving digitally controlled oscillator operations. The man-machine interface was examined. Problems regarding procedural documentation were resolved. J.D.H.

N82-16136*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

EMERGENCY TELEMETRY PERFORMANCE **c17**

W. Tisdale *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 335-340 ref (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 09F

Often an emergency telemetry mode is automatically selected by a spacecraft during emergencies. During such emergencies the Deep Space Network must acquire the spacecraft telemetry as rapidly as possible under weak fluctuating signal conditions. Test data herein show the bit error properties of one emergency telemetry mode candidate with a very low bit rate of 4 bits per second. Analysis reveals the E sub b/N sub O necessary to obtain the performance bit error rate threshold and associated acquisition times. Author

N82-16137*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

GOLDSTONE STDN 9-METER RADIATION TEST **c32**

J. R. Blain *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 341-351 (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20N

The Goldstone spaceflight tracking and data network (STDN) 9-meter tests were conducted from February through July 1981 to characterize the near-field radiation patterns of the S-band and fourth harmonic frequency emissions. The test configurations and results are presented with graphs of the antenna patterns. The tests indicated that X-band leakage may be suppressed to levels of approximately -190 dBm/sq cm at 200 meters. Author

N82-16138*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SOLAR POWERED WATER PURIFICATION SYSTEM AT GOLDSTONE (DSS 13) **c44**

F. J. Menninger and R. J. Elder *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 352-354 (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 10A

The present energy intensive electrically powered still at the Venus Deep Space Station (DSS 13) has reached its end-of-life. The electric still has been producing the pure water required for cooling the 400-kW klystron tube of the Venus 26-m antenna at Goldstone, California. A new passive solar still, unique to the Goldstone complex, has been designed to replace the electric still. This new system will deliver 100% of the pure water requirement for cooling the klystron tube and will consume an insignificant amount of electrical energy. Construction will be completed by the end of 1981, followed by a one-year test and evaluation period to gather data on performance characteristics. Author

N82-16139*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ENERGY CONSUMPTION FOR THE ECHO STATION (DSS 12) **c44**

C. N. Guiar and D. Schonfeld *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 355-363 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 10B

Energy consumption for the Echo Station is analyzed. The HVAC equipment including vapor compression refrigeration units, absorption chillers, annd heating units such as boilers and heat pumps is shown to be the largest consumer of electrical energy. The energy consumption for the buildings at the station is itemized and compared to the electrical meter data. The figures for energy consumption as predicted by the ECP computer program are found to agree well with the meter data. J.D.H.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-16104*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BLOCK 1 PHASE 2 VERY LONG BASELINE INTERFEROMETRY IMPLEMENTATION
J. H. Wilcher *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 15-18 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

N82-16106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT, 1
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 24-26 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

N82-16107*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT, 2
N. Fanelli and H. Nance *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 27-29 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

N82-16118*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSS 13 UNATTENDED OPERATIONS STATION CONTROLLER Status Report
H. Cooper *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 133-137 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

N82-16131*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GCF-NOCC RECONFIGURATION
J. P. McClure *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 288-290 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 22D

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-16140*# National Aeronautics and Space Administration, Washington, D. C.
AUXILIARY SUBPROGRAMS FOR CALCULATING THE NAVIGATIONAL PARAMETERS OF ARTIFICIAL EARTH SATELLITES. FORTRAN IV
V. I. Prokhorenko Jun. 1981 60 p refs Transl. into ENGLISH of "Vspomogatelnyye Podgrogrammy dlya Rascheta Navigatsionnykh Parametrov Iskusstvennykh Sputnikov Zemli. FORTRAN IV" rept. Pr-301, Moscow, 1976 59 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Space Research, Academy of Sciences (USSR), Moscow (Contract NASw-3199)
(NASA-TM-75684) Avail: NTIS HC A04/MF A01 CSCL 22B

Subprograms for transforming coordinates and time, for determining the position of the Moon and Sun, and for calculating the atmosphere and disturbances, which are specified by anomalies of the Earth's gravitational field are described. The subprograms are written in FORTRAN IV and form a major part of the package of applied programs for calculating the navigational parameters of artificial Earth satellites. S.L.

N82-17053*# Carroll Coll., Helena, Mont. Dept. of Mathematics and Physics.
A STUDY OF THE VENT PIPE FOR THE GRAVITY PROBE-B
Ronald N. Knoshaug *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-16141*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: SPACE SHUTTLE PROGRAM STS-2
[1982] 25 p refs
(NASA-TM-84088; M-989-81-02) Avail: NTIS HC A02/MF A01 CSCL 22A

Objectives for the second space shuttle mission are reviewed and their achievement assessed. Details of the flight are described with emphasis on launch; ascent; solid rocket booster and external tank disposal; on-orbit; descent and landing; and ground operations and turnaround. The net result of the implementation of the adjusted preplanned minimum mission of 54 hours (instead of the 124 hour mission) was that approximately 90% of the major functional test objectives were successfully accomplished, and 60% of the tests requiring on-orbit crew involvement were completed. Of the total 308 tests planned for the full duration mission, 253 (82%) were accomplished. Of 94 desired science data takes, 64 were completed and about 73 hours of data were acquired on the various sensors. A.R.H.

N82-16142*# National Aeronautics and Space Administration, Washington, D. C.
REPORT BY THE AEROSPACE SAFETY ADVISORY PANEL Annual Report, 1981
1981 37 p refs
(NASA-TM-84094) Avail: NTIS HC A03/MF A01 CSCL 22A

The process of preparation for the first two shuttle flights was observed and information from both flights was gathered in order to confirm the concept and performance of the major elements of the space transportation system. To achieve truly operational operating safety, regularity, and minimum practical cost, the organization of efforts between the R&D community and any transportation service organization should be clearly separated with the latter organization assuming responsibilities for marketing its services; planning and acquiring prime hardware and spares; maintainance; certification of procedures; training; and creation of requirements for future development. A technical audit of the application of redundancy concepts to shuttle systems is suggested. The state of the art of space transportation hardware suggests that a number of concept changes may improve reliability, costs, and operational safety. For the remaining R&D

flights, it is suggested that a redline audit be made of limits that should not be exceeded for ready to launch. A.R.H.

N82-16143*# Engineering Analysis, Inc., Huntsville, Ala.
ADVANCED SPACE SHUTTLE SIMULATION MODEL
Frank B. Tatom and S. Ray Smith 11 Jan. 1982 108 p refs (Contract NAS8-33818)
(NASA-CR-161958; EAI-TR-82-001) Avail: NTIS HC A06/MF A01 CSCL 22B

A non-recursive model (based on von Karman spectra) for atmospheric turbulence along the flight path of the shuttle orbiter was developed. It provides for simulation of instantaneous vertical and horizontal gusts at the vehicle center-of-gravity, and also for simulation of instantaneous gusts gradients. Based on this model the time series for both gusts and gust gradients were generated and stored on a series of magnetic tapes, entitled Shuttle Simulation Turbulence Tapes (SSTT). The time series are designed to represent atmospheric turbulence from ground level to an altitude of 120,000 meters. A description of the turbulence generation procedure is provided. The results of validating the simulated turbulence are described. Conclusions and recommendations are presented. One-dimensional von Karman spectra are tabulated, while a discussion of the minimum frequency simulated is provided. The results of spectral and statistical analyses of the SSTT are presented. N.W.

N82-17051*# University of Central Florida, Orlando. Dept. of Physics.
A PRELIMINARY STUDY OF THE PARTICULATE FALLOUT FROM THE SPACE SHUTTLE (STS-1)
G. Martin Hudson *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 8 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-16144# Osborne-Hoffman, Inc., Point Pleasant Beach, N.J.
ADVANCED UNDERWATER TELEMETRY AND VOICE LINKS FOR INLAND AND COASTAL WATERS RESEARCH
E. Hoffman 1981 55 p refs
(Grant NSF DAR-80-09716)
(PB81-241408; NSF/MEA-81007) Avail: NTIS HC A04/MF A01 CSCL 17B

The feasibility of the spread spectrum approach is demonstrated. Data from which a high rate underwater data link can be designed are derived. Underwater transmission rates of over 1 Kbit/s are shown to be feasible. GRA

N82-16136*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EMERGENCY TELEMETRY PERFORMANCE
W. Tisdale *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 335-340 ref (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-16145*# Lockheed Missiles and Space Co., Palo Alto, Calif.
FEASIBILITY STUDY FOR LONG LIFETIME HELIUM DEWAR Final Report, Jan. - Dec. 1981
R. T. Parmley Dec. 1981 191 p refs
(Contract NAS2-10848)
(NASA-CR-166254) Avail: NTIS HC A09/MF A01 CSCL 22B

A feasible concept for a launchable three year lifetime helium dewar was investigated. Current helium dewar designs were examined to see where the largest potential reductions in parasitic heat loads can be made. The study was also devoted to examining support concepts. The support concept chosen, a passive orbital disconnect strut (PODS), has an orbital support conductance that is lower by more than an order of magnitude over current tension band supports. This lower support conductance cuts the total dewar weight in half for the same three year life time requirements. Effort was also concentrated on efficient wire feed through designs and vapor cooling of the multilayer insulation, supports, wire feed throughs and plumbing penetrations. A single stage helium dewar vs. dual stage dewars with a guard cryogen of nitrogen or neon was examined. The single stage dewar concept was selected. Different support concepts were analyzed from which the PODS support concepts was chosen. A preliminary design of the dewar was thermally and structurally analyzed and laid out including system weights, thermal performance and performance sensitivities. S.L.

N82-16146# Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.
NATURAL MODES AND REAL MODAL VARIABLES FOR FLEXIBLE SPACECRAFT
F. R. Vigneron Nov. 1981 23 p refs
(CRC-1348) Avail: NTIS HC A02/MF A01

A natural model transformation theory which is applicable to flexible spacecraft with damping and gyroscopic forces is described. The theory is arranged into a form which is a generalization of the classical normal modes transformation theory. Modal differential equations are given in terms of real-value scalars. Block diagrams in the time and Laplace transform domains demonstrate the feed-forward and second-order filter characteristics of the structure of the equations. Results for a single-axis flexible dynamics example are compared with earlier published results to show the correlation with the classical normal modes transformation theory. B.W.

N82-16147*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME :PROGRAM AND SYSTEMS SUMMARIES: MECHANICAL AND THERMAL DETAILS Final Report
Robert O. Wales, ed. Nov. 1981 272 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-1; Rept-81F0034-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 22B

The overall mission and spacecraft systems, testing, and operations are summarized. The mechanical subsystems are reviewed, encompassing mechanical design requirements; separation and deployment mechanisms; design and performance evaluation; and the television camera reflector monitor. Thermal control and contamination are discussed in terms of thermal control subsystems, design validation, subsystems performance, the advanced flight experiment, and the quartz-crystal microbalance contamination monitor. N.W.

N82-16148*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME 2: ORBIT AND ATTITUDE CONTROLS Final Report
Robert O. Wales, ed. Nov. 1981 289 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-2; Rept-81F0034-Vol-2) Avail: NTIS HC A13/MF A01

Attitude control is reviewed, encompassing the attitude control subsystem, spacecraft attitude precision pointing and slewing adaptive control experiment, and RF interferometer experiment. The spacecraft propulsion system (SPS) is discussed, including subsystem, SPS design description and validation, orbital operations and performance, in-orbit anomalies and contingency operations, and the cesium bombardment ion engine experiment. Thruster failure due to plugging of the propellant feed passages, a major cause for mission termination, are considered among the critical generic failures on the satellite. N.W.

N82-16149*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME 3: TELECOMMUNICATIONS AND POWER Final Report
Robert O. Wales, ed. Nov. 1981 298 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-3; Rept-81F0034-Vol-3) Avail: NTIS HC A13/MF A01 CSCL 22B

Functional design requirements and in-orbit operations, performance, and anomalies are discussed for (1) the communications subsystem, (2) the electrical power system, and (3) the telemetry and command subsystem. The latter includes a review of ground support. Tracking and data relay experiments and the Apollo-Soyuz test program are reviewed. N.W.

N82-16150*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME 4: TELEVISION EXPERIMENTS Final Report
Robert O. Wales, ed. Nov. 1981 149 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-4; Rept-81F0034-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 22B

Experiments sponsored by the US Department of Health Education and Welfare are discussed, including telecommunications, Alaskan health service, Appalachian education satellite project, and the University of the West Indies. The Satellite Instructional Television Experiment in India is reviewed. Independent television experiments are addressed, including AIDSAT and Project Look Up. N.W.

N82-16151*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME 5: PROPAGATION EXPERIMENTS Final Report
Robert O. Wales, ed. Nov. 1981 302 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-5; Rept-81F0034-Vol-5) Avail: NTIS HC A14/MF A01 CSCL 22B

Propagation experiments at 1550 MHz to 1650 MHz are reviewed, including the Integrated L-Band Experiments system and results, and the Mobile L-Band Terminals for Satellite Communication system. Experiments at 4 GHz to 6 GHz are reported, including the Radio Frequency Interferometer Measurements system and results, and Earth station antenna evaluations. Experiments above 10 GHz are discussed, including Comsat and ATS-6 millimeter wave propagation/experiments, and communication ATS-6 version at 20 and 30 GHz. N.W.

N82-16152*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-6 ENGINEERING PERFORMANCE REPORT. VOLUME 6: SCIENTIFIC EXPERIMENTS Final Report
Robert O. Wales, ed. Nov. 1981 166 p refs 6 Vol.
(Contract NAS5-25464)
(NASA-RP-1080-Vol-6; Rept-81F0034-Vol-6) Avail: NTIS HC A08/MF A01 CSCL 22B

Evaluations include a very high resolution radiometer, a radio beacon experiment, environmental measurement experiments (EME), EME support hardware, EME anomalies and failures, EME results, and US/USSR magnetometer experiments. N.W.

N82-16153*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE MICROWAVE RADIOMETER SPACECRAFT: A DESIGN STUDY
Robert L. Wright, ed. Dec. 1981 239 p refs
(NASA-RP-1079; L-14258) Avail: NTIS HC A11/MF A01 CSCL 22B

A large passive microwave radiometer spacecraft with near all weather capability of monitoring soil moisture for global crop forecasting was designed. The design, emphasizing large space structures technology, characterized the mission hardware at the conceptual level in sufficient detail to identify enabling and pacing technologies. Mission and spacecraft requirements, design and structural concepts, electromagnetic concepts, and control concepts are addressed. For individual titles, see N82-16154 through N82-16167.

N82-16154*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE MICROWAVE RADIOMETER SPACECRAFT. A DESIGN STUDY: EXECUTIVE SUMMARY
Uriel M. Lovelace *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 1-14 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

A conceptual design was developed for a microwave radiometer spacecraft (MRS) using a large passive reflector, microwave radiometer, and advanced control concepts soil moisture mapping from microwave sensing for global crop forecasting. Mission requirements and tradeoffs were defined, and major subsystems (structural, electromagnetic surface, and attitude control) conceptually designed. An overview of the mission and a summary of the study results are presented. J.M.S.

N82-16155*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MISSION DEFINITION FOR A LARGE-APERTURE MICROWAVE RADIOMETER SPACECRAFT
Lloyd S. Keafer, Jr. *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 17-32 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

An Earth-observation measurements mission is defined for a large-aperture microwave radiometer spacecraft. This mission is defined without regard to any particular spacecraft design concept. Space data application needs, the measurement selection rationale, and broad spacecraft design requirements and constraints are described. The effects of orbital parameters and image quality requirements on the spacecraft and mission performance are discussed. Over the land the primary measurand is soil moisture; over the coastal zones and the oceans important measurands are salinity, surface temperature, surface winds, oil spill dimensions and ice boundaries; and specific measurement requirements have been selected for each. Near-all-weather operation and good spatial resolution are assured by operating at low microwave frequencies using an extremely large aperture antenna in a low-Earth-orbit contiguous mapping mode. Author

N82-16156*# Massachusetts Univ., Amherst.
HIGH-RESOLUTION PASSIVE MICROWAVE IMAGING OF THE SURFACE OF THE EARTH
Calvin T. Swift *In* NASA. Langley Research Center The Microwave Radiometer Spacecraft Dec. 1981 p 3-41 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

The physics of passive microwave observations of the Earth and the system requirements for high-resolution imaging within this spectral band are summarized. High resolution is achieved in a straightforward manner by increasing the size of the primary antenna. However, with a single receiver, it is shown that the combination of high resolution and crosstrack scanning cannot produce images which have valuable geophysical content. The concept of a multiple receiver array located in the focal plane is presented as the only practical solution to the dilemma. Exploring

this concept, system requirements are generated which, for the first order, appear to offer solutions to the problem. Author

N82-16157*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIOMETER DESIGN CONCEPTS FOR LARGE APERTURE MICROWAVE RADIOMETER SPACECRAFT
Lloyd S. Keafer, Jr. *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 43-49 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

Concepts involving active and passive microwave systems for soil-moisture monitoring are discussed. It is shown that the first major development efforts should be directed toward the simpler passive design concepts. Subsequently, five passive design concepts for a microwave radiometer spacecraft are outlined and compared. Some common technology needs, such as large space structures and controls, are shown to exist. Also, some peculiar technology needs are identified, such as complicated phasing networks, dielectric lenses, tapered illumination, and reflector-surface irregularity and distortion control techniques. More detailed studies to address these design concepts and assess the associated technology needs are recommended.
J.M.S.

N82-16158*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVOLUTION AND DESIGN CHARACTERISTICS OF THE MICROWAVE RADIOMETER SPACECRAFT
Robert L. Wright *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 51-66 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

The evolution of the design of the microwave radiometer spacecraft from conception to preliminary design is described. Alternatives and tradeoff rationale are described, and the configuration and structural design features that were developed and refined during the design processes are presented for the three structural configurations studied (two geodesic trusses and a flexible catenary). Author

N82-16159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SYSTEMS DESIGN AND ANALYSIS OF THE MICROWAVE RADIOMETER SPACECRAFT
L. Bernard Garrett *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 69-94 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

Systems design and analysis data were generated for microwave radiometer spacecraft concept using the Large Advanced Space Systems (LASS) computer aided design and analysis program. Parametric analyses were conducted for perturbations off the nominal-orbital-altitude/antenna-reflector-size and for control/propulsion system options. Optimized spacecraft mass, structural element design, and on-orbit loading data are presented. Propulsion and rigid-body control systems sensitivities to current and advanced technology are established. Spacecraft-induced and environmental effects on antenna performance (surface accuracy, defocus, and boresight off-set) are quantified and structured material frequencies and modal shapes are defined. Author

N82-16160*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY DESIGN OF TETRAHEDRAL TRUSS REFLECTOR STRUCTURE
Michael F. Card and J. Kermit Jensen (Kentron International, Inc.) *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 95-107 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

A baseline structure proposed for the microwave radiometer spacecraft (MRS) reflector is a large graphite-epoxy truss. The truss structure was selected to provide adequate stiffness to minimize control problems and to provide a low-expansion 'strong back' on which to mount and control reflector mesh panels. Details of the structural members, joints and assembly concepts are presented, a concept for the reflector mesh surface is discussed, and preliminary estimates of the mass and structural natural frequencies of the reflector system are presented. Author

N82-16161*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WEIGHT ESTIMATES AND PACKAGING TECHNIQUES FOR THE MICROWAVE RADIOMETER SPACECRAFT
J. Kermit Jensen (Kentron International, Inc.) and Robert L. Wright *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 109-125 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

Estimates of total spacecraft weight and packaging options were made for three conceptual designs of a microwave radiometer spacecraft. Erectable structures were found to be slightly lighter than deployable structures but could be packaged in one-tenth the volume. The tension rim concept, an unconventional design approach, was found to be the lightest and transportable to orbit in the least number of shuttle flights. Author

N82-16162*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELECTROMAGNETIC DESIGN OF A MICROWAVE RADIOMETER ANTENNA SYSTEM
P. K. Agrawal (RCA, Moorestown, N.J.) and C. R. Cockrell *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 129-136 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

A preliminary electromagnetic (EM) design of a radiometric antenna system was developed for the microwave radiometer spacecraft mission. The antenna system consists of a large spherical reflector and an array of feed horns along a concentric circular arc in front of the reflector. The reflector antenna was sized to simultaneously produce 200 contiguous 1 km diameter footprints with an overall beam efficiency of 90 percent, and the feed horns and feed horn array were designed to monitor the radiation from the footprints. Author

N82-16163*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF RANDOM DISTORTIONS ON THE SURFACE ACCURACY OF A LARGE ANTENNA
C. R. Cockrell and Leo Staton *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 137-140 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

The effects of random reflector distortions or irregularities on a reflector's radiation pattern are discussed. The importance of such surface deviations with respect to a radiometric reflector antenna is addressed. Author

N82-16164*# Harris Corp., Melbourne, Fla.
EFFECTS OF ANTENNA BLOCKAGE ON RADIO FREQUENCY PERFORMANCE OF THE MICROWAVE RADIOMETER SPACECRAFT
L. D. Sikes and T. Hower *In* NASA. Langley Research Center The Microwave Radiometer Spacecraft Dec. 1981 p 141-165 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

Radio frequency scaled models of the microwave radiometer spacecraft suspended feed concept were tested to determine the effects of aperture blockage on the antenna radiation pattern. Contributors to the uncertainty of the test measurements were evaluated, and an estimate of the blockage effects was made for comparison with the test measurements. The gain loss budget associated with reflector performance characteristics (aperture blockage, surface reflectivity, reflector roughness, and defocus) was determined. Author

N82-16165*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADAPTIVE CONTROL SYSTEM FOR LARGE ANNULAR MOMENTUM CONTROL DEVICE
Raymond C. Montgomery and C. Richard Johnson, Jr. (Virginia Polytechnic Inst. and State Univ.) *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 169-187 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

A dual momentum vector control concept, consisting of two

counterrotating rings (each designated as an annular momentum control device), was studied for pointing and slewing control of large spacecraft. In a disturbance free space environment, the concept provides for three axis pointing and slewing capabilities while requiring no expendables. The approach utilizes two large diameter counterrotating rings or wheels suspended magnetically in many race supports distributed around the antenna structure. When the magnets are energized, attracting the two wheels, the resulting gyroscopic torque produces a rate along the appropriate axis. Roll control is provided by alternating the radiative rotational velocity of the two wheels. Wheels with diameters of 500 to 800 m and with sufficient momentum storage capability require rims only a few centimeters thick. The wheels are extremely flexible; therefore, it is necessary to account for the distributed nature of the rings in the design of the bearing controllers. Also, ring behavior is unpredictably sensitive to ring temperature, spin rate, manufacturing imperfections, and other variables. An adaptive control system designed to handle these problems is described. J.M.S.

N82-16166*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BIAXIAL AND ELECTROSTATIC TENSIONING EFFECTS ON THIN MEMBRANE MATERIALS
William F. Hinson, J. W. Goslee, John R. McIlhaney (Kentron International, Inc.), and James H. Ramsey (Kentron International, Inc.) *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 189-204 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

Thin membrane materials were subjected to biaxial and electrostatic tensioning loads to study techniques for maintaining surface smoothness of a thin membrane antenna. The basic mechanical and electrical setup for the tests is described and preliminary measurements of surface smoothness and surface deviation are presented. Author

N82-16167*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BOOTLACE CATENARY CONCEPT FOR ANTENNA SHAPE CONTROL
James H. Ramsey (Kentron International, Inc.) and Robert L. Wright *In its* The Microwave Radiometer Spacecraft Dec. 1981 p 205-213 refs (For primary document see N82-16153 07-18)
Avail: NTIS HC A11/MF A01 CSCL 22B

A preliminary design of the microwave radiometer spacecraft (MRS) using the bootlace catenary shaping concept was developed. The application of this radically different design for shape control of the antenna membrane was assessed and possible sources of inaccuracies and errors were investigated. Author

N82-16168# Control Dynamics Co., Huntsville, Ala.
ACOSS NINE (ACTIVE CONTROL OF SPACE STRUCTURES) Final Technical Report, 1 Apr. 1980 - 1 Apr. 1981
Sherman M. Seltzer, H. Eugene Worley, Bernard A. Asner, Jr., and Dragoslav D. Siljak Griffiss AFB, N.Y. RADC Sep. 1981 132 p refs
(Contract F30602-80-C-0177; ARPA Order 3653; AF Proj. C654)
(AD-A106686; RADC-TR-81-240) Avail: NTIS HC A07/MF A01 CSCL 22/2

This is the Control Dynamics Final Report on the analysis and evaluation of Large Space Structures. The research was primarily aimed at mathematical model development and control system analysis and design tool development. Author (GRA)

N82-16169# Control Dynamics Co., Huntsville, Ala.
ACOSS SEVEN (ACTIVE CONTROL OF SPACE STRUCTURES) Final Technical Report, 17 Apr. - 19 Dec. 1980
John R. Sesak Griffiss AFB, N.Y. RADC Sep. 1981 103 p refs
(Contract F30602-80-C-0164; ARPA Order 3654; AF Proj. C654)
(AD-A106687; RADC-TR-81-241) Avail: NTIS HC A06/MF A01 CSCL 22/2

This report covers active structural control theory extensions, simulations, and demonstration test planning as they relate to precision control of large space systems. Theory material includes a filter accommodation technique for stabilizing higher modes without degrading controlled mode performance, Liapunov stability analysis, and disturbance accommodation techniques for systems where damping alone cannot meet requirements. Author (GRA)

N82-17046*# Eastern Connecticut State College, Willimantic. Dept. of Mathematical Sciences.
FUEL OPTIMAL MANEUVERS FOR SPACECRAFT WITH FIXED THRUSTERS
Thomas C. Carter *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

N82-17057*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
ATTITUDE CONTROL OF THE SPACE CONSTRUCTION BASE: A MODULAR APPROACH
Daniel A. OConnor *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 35 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-16170*# Ball Aerospace Systems Div., Boulder, Colo.
BREADBOARD STELLAR TRACKER SYSTEM TEST REPORT, VOLUME 1 Final Report
J. C. Kollodge, M. W. Hubbard, S. Jain, and C. A. Schons 1 Aug. 1981 192 p refs
(Contract NAS8-34263)
(NASA-CR-161953; TR-81-04-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 14B

The performance of a star tracker equipped with a focal plane detector was evaluated. The CID board is an array of 256 x 256 pixels which are 20 x 20 micrometers in dimension. The tracker used for test was a breadboard tracker system developed by BASD. Unique acquisition and tracking algorithms are employed to enhance performance. A pattern recognition process is used to test for proper image spread function and to avoid false acquisition on noise. A very linear, high gain, interpixel transfer function is derived for interpolating star position. The lens used in the tracker has an EFL of 100 mm. The tracker has an FOV of 2.93 degrees resulting in a pixel angular subtense of 41.253 arc sec in each axis. The test procedure used for the program presented a star to the tracker in a circular pattern of positions; the pattern was formed by projecting a simulated star through a rotatable deviation wedge. Further tests determined readout noise, Noise Equivalent Displacement during track, and spatial noise during acquisition by taking related data and reducing it. M.D.K.

N82-16171*# Ball Aerospace Systems Div., Boulder, Colo.
BREADBOARD STELLAR TRACKER SYSTEM TEST REPORT, VOLUME 2 Final Report
1 Aug. 1981 264 p refs
(Contract NAS8-34263)
(NASA-CR-161954; TR-81-04-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 14B

Complete data from a test program designed to evaluate the performance of a star tracker, a breadboard tracker system, is presented in tabular form. All data presented was normalized to the pixel dimension of 20 micrometers. Data from determination of maximum spatial noise as it applies to the coarse and fine acquisition modes is presented. Pointing accuracy test data, raw pixel data for the track cycle, and data from equipment related tests is also presented. M.D.K.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-16172*# Rocketdyne, Canoga Park, Calif.
REUSABLE ROCKET ENGINE MAINTENANCE STUDY Final Report, Sep. 1980 - Oct. 1981
Charles A. MacGregor Jan. 1982 306 p
(Contract NAS3-22652)
(NASA-CR-165569; RI/RD81-226) Avail: NTIS HC A14/MF A01 CSCL 21H

Approximately 85,000 liquid rocket engine failure reports, obtained from 30 years of developing and delivering major pump feed engines, were reviewed and screened and reduced to 1771. These were categorized into 16 different failure modes. Failure propagation diagrams were established. The state of the art of engine condition monitoring for in-flight sensors and between flight inspection technology was determined. For the 16 failure modes, the potential measurands and diagnostic requirements were identified, assessed and ranked. Eight areas are identified requiring advanced technology development. T.M.

N82-16173# ARO, Inc., Arnold Air Force Station, Tenn.
TIME- AND SPACE-DEPENDENCE OF PARTICULATE EFFLUENT IN THE EXHAUST PLUME OF A PULSED LIQUID BIPROPELLANT ENGINE Final Report, 1 Oct. 1979 - 30 Jun. 1980
B. P. Curry, J. W. L. Lewis, J. H. Jones, and H. M. Powell AEDC Oct. 1981 25 p refs
(AD-A106525; AEDC-TR-80-44) Avail: NTIS HC A02/MF A01 CSCL 21/2

The temporal and radial profiles of particulate mean sizes and densities in the exhaust plume of a pulsed 5-lbf thrust liquid bipropellant rocket engine have been determined. The primary goal of this analysis has been to establish the capability of simulating the characteristics of multi-second firings at high altitude. The results demonstrate that steady-state particle formulation kinetics are achieved in times on the order of 10 milliseconds. Further, combustion instability was shown to be unimportant for combustion chamber length-to-diameter ratios less than 30. The particle size and flux measurements reported here additionally demonstrate the utility of Mie scattering techniques for pulsed engine testing and contamination tests.
Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-16174* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYNTHESIS OF POLYFORMALS Patent
Algirdas C. Poshkus, inventor (to NASA) (NAS-NRC, Washington, D.C.) Issued 7 Jul. 1981 3 p Filed 3 Jul. 1979 Supersedes N79-30376 (17 - 21, p 2793) Sponsored by NASA
(NASA-Case-ARC-11244-1; US-Patent-4,277,402; US-Patent-Appl-SN-054501; US-Patent-Class-260-340.9R; US-Patent-Class-568-445; US-Patent-Class-568-497) Avail: US Patent and Trademark Office CSCL 07C

Formals of CH2OH(CHOH) sub n CH2OH polyols (n = 2 to 4) are prepared in less than 15 minutes by heating to about 125 C, a mixture of e.g. sorbitol and paraformaldehyde in slight excess (5 to 10%), in the presence of e.g. sulfuric acid in catalytic quantities. Elution with methanol and filtration yield the pure solid cyclic triformal. The process can be carried in stages, using almost stoichiometric quantities of paraformaldehyde, but without any change in overall heating time.
Official Gazette of the U.S. Patent and Trademark Office

N82-16175*# National Aeronautics and Space Administration, Washington, D. C.
PLASMA CHEMISTRY AND ORGANIC SYNTHESIS
Meguru Tezuka Jul. 1980 16 p refs Transl. into ENGLISH from Kagaku Kogyo (Japan), Apr. 1980 p 348-352 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Saitama Technical Coll., Japan
(Contract NASw-3199)
(NASA-TM-75843) Avail: NTIS HC A02/MF A01 CSCL 07A

The characteristic features of chemical reactions using low temperature plasmas are described and differentiated from those seen in other reaction systems. A number of examples of applications of plasma chemistry to synthetic reactions are mentioned. The production of amino acids by discharge reactions in hydrocarbon-ammonia-water systems is discussed, and its implications for the origins of life are mentioned. Author

N82-17047*# Alabama A & M Univ., Huntsville. Dept. of Chemistry.
SOLIDIFICATION PHENOMENA OF BINARY ORGANIC MIXTURES
Kichoon Chang *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07A

24 COMPOSITE MATERIALS

Includes laminates.

N82-16176*# TRW, Inc., Cleveland, Ohio.
FABRICATION OF BORON/ALUMINUM FAN BLADES FOR SCR ENGINES Final Report, Jun. 1976 - Jun. 1980
G. S. Doble Mar. 1981 49 p refs
(Contract NAS3-20360)
(NASA-CR-165294; ER-7891-F) Avail: NTIS HC A03/MF A01 CSCL 11D

The fabrication of boron/aluminum fan blades for the F-404 Supersonic Cruise Research prototype engine by rapid air bonding of fully dense monotapes is described, and the fan blades evaluated. The F-404 configuration is representative of a low aspect ratio advanced design blade with supersonic capability. Dovetail pull tests of this geometry, which substituted boron/aluminum for titanium, suggested that excessive shear stresses were present in the root. A re-designed blade, incorporating a titanium tang and root, was fabricated by hot isostatic pressing. Blades appeared well bonded but the airfoil contained sizable areas of deformation and identification from the alumina grain used as a pressure transmitting medium. The use of hot isostatic pressing with a formed steel encapsulator should eliminate this problem. J.D.H.

N82-16177*# Materials Sciences Corp., Spring House, Pa.
DEVELOPMENT OF AN ENGINEERING ANALYSIS OF PROGRESSIVE DAMAGE IN COMPOSITES DURING LOW VELOCITY IMPACT Final Report, 3 Aug. 1979 - 15 Sep. 1981
E. A. Humphreys Jul. 1981 123 p refs
(Contract NAS1-15888)
(NASA-CR-165778; MSC-TFR-1205/0208) Avail: NTIS HC A06/MF A01 CSCL 11D

A computerized, analytical methodology was developed to study damage accumulation during low velocity lateral impact of layered composite plates. The impact event was modeled as perfectly plastic with complete momentum transfer to the plate structure. A transient dynamic finite element approach was selected to predict the displacement time response of the plate structure. Composite ply and interlaminar stresses were computed at selected time intervals and subsequently evaluated to predict layer and interlaminar damage. The effects of damage on elemental stiffness were then incorporated back into the analysis for

subsequent time steps. Damage predicted included fiber failure, matrix ply failure and interlaminar delamination. Author

N82-16178*# Boeing Commercial Airplane Co., Seattle, Wash.
ENVIRONMENTAL EXPOSURE EFFECTS ON COMPOSITE MATERIALS FOR COMMERCIAL AIRCRAFT Interim Technical Report, Nov. 1977 - Jul. 1981
Martin N. Gibbins and Daniel J. Hoffman Washington NASA Jan. 1982 129 p refs
(Contract NAS1-15148)
(NASA-CR-3502; D6-51227) Avail: NTIS HC A07/MF A01 CSCL 11D

The effects of environmental exposure on composite materials are studied. The environments considered are representative of those experienced by commercial jet aircraft. Initial results have been compiled for the following material systems: T300/5208, T300/5209 and T300/934. Specimens were exposed on the exterior and interior of Boeing 737 airplanes of three airlines, and to continuous ground level exposure at four locations. In addition specimens were exposed in the laboratory to conditions such as: simulated ground-air-ground, weatherometer, and moisture. Residual strength results are presented for specimens exposed for up to two years at three ground level exposure locations and on airplanes from two airlines. Test results are also given for specimens exposed to the laboratory simulated environments. Test results indicate that short beam shear strength is sensitive to environmental exposure and dependent on the level of absorbed moisture. S.L.

N82-16179*# National Aeronautics and Space Administration, Washington, D. C.
A PROCESS FOR THE PRODUCTION OF A SCALE-PROOF AND CORROSION-RESISTANT COATING ON GRAPHITE AND CARBON BODIES
Erich Fitzer Dec. 1981 8 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76785) Avail: NTIS HC A02/MF A01 CSCL 11D

A process for the production of a corrosion resistant coating on graphite and carbon bodies is described. The carbon or graphite body is coated or impregnated with titanium silicide under the addition of a metal containing wetting agent in a nitrogen free atmosphere, so that a tight coating is formed. J.D.H.

N82-16180*# National Aeronautics and Space Administration, Washington, D. C.
METHOD OF PREVENTING OXIDATION OF GRAPHITE FIREPROOF MATERIAL
S. Yamauchi and H. Suzuki Dec. 1981 10 p Transl. into ENGLISH of Japanese Patent no. 29-3485, 1954 10 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76786) Avail: NTIS HC A02/MF A01 CSCL 11D

A method of preventing oxidation of graphite fireproof material is given. A blend of 1 to 33 weight parts alumina and 3 to 19 parts of K2O + Na2O in 100 parts of SiO2 is pulverized followed by addition of 5 to 160 parts of silicon carbide powder in 100 parts of the mixture. This is thoroughly blended and coated on the surface of graphite fireproof material. J.D.H.

N82-16181*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
PREDICTION OF COMPOSITE HYGRAL BEHAVIOR MADE SIMPLE
Christos C. Chamis and J. H. Sinclair 1982 30 p refs Presented at the 37th Ann. Conf. of the Soc. of the Plastics Ind. (SPI), Washington, D.C., 12-15 Jan. 1982
(NASA-TM-82780; E-1022) Avail: NTIS HC A03/MF A01 CSCL 11D

A convenient procedure is described to determine the hygral behavior (moisture expansion coefficients and moisture stresses) of angleplied fiber composites using a pocket calculator. The procedure consists of equations and appropriate graphs for various (+ or - theta) ply combinations. These graphs present reduced stiffness and moisture expansion coefficients as functions of (+ or - theta) in order to simplify and expedite the use of the equations. The procedure is applicable to all types of balanced, symmetric fiber composites including interply and intraply hybrids. The versatility and generality of the procedure is illustrated using several step-by-step numerical examples. Author

N82-16182*# Rensselaer Polytechnic Inst., Troy, N. Y. School of Engineering.
COMPOSITE STRUCTURAL MATERIALS Semiannual Progress Report, 30 Apr. - 30 Sep. 1981
George S. Ansell, Robert G. Loewy, and Stephen E. Wiberly Dec. 1981 164 p refs Sponsored in part by Air Force
(Grant NGL-33-018-003)
(NASA-CR-165121; SAR-41) Avail: NTIS HC A08/MF A01 CSCL 11D

Physical properties of fiber reinforced composites; structural concepts and analysis; manufacturing; reliability; and life prediction are subjects of research conducted to determine the long term integrity of composite aircraft structures under conditions pertinent to service use. Progress is reported in (1) characterizing homogeneity in composite materials; (2) developing methods for analyzing composite materials; (3) studying fatigue in composite materials; (4) determining the temperature and moisture effects on the mechanical properties of laminates; (5) numerically analyzing moisture effects; (6) numerically analyzing the micromechanics of composite fracture; (7) constructing the 727 elevator attachment rib; (8) developing the L-1011 engine drag strut (CAPCOMP 2 program); (9) analyzing mechanical joints in composites; (10) developing computer software; and (11) processing science and technology, with emphasis on the sailplane project. A.R.H.

N82-16183# Forest Products Lab., Madison, Wis.
OVERALL EFFECTIVE THERMAL RESISTANCE OF CORRUGATED FIBERBOARD CONTAINERS
David W. Bormett Aug. 1981 13 p refs
(AD-A106569; FSRP-FPL-406) Avail: NTIS HC A02/MF A01 CSCL 13/4

The overall effective thermal resistance of a corrugated fiberboard container was determined as a function of air velocity and board thickness, and an appropriate design curve is presented. The thermal resistance of the container is treated as a sum of resistance, with individual resistance values presented for the interior interfacial contact resistance, the board resistance, and the exterior boundary resistance. Behavioral differences were found for heating versus cooling at conventional board thickness and a possible explanation for this behavior is presented. GRA

N82-16184# Forest Products Lab., Madison, Wis.
EFFECT OF PAPERBOARD STRESS-STRAIN CHARACTERISTICS ON STRENGTH OF SINGLEWALL CORRUGATED FIBERBOARD: A THEORETICAL APPROACH
Thomas J. Urbanik Jul. 1981 18 p refs
(AD-A106566; FSRP-FPL-401) Avail: NTIS HC A02/MF A01 CSCL 11/5

The stress-strain relationship for paperboard loaded in edgewise compression relates to the strength of singlewall corrugated containers. This relationship can be approximated from the paperboard characteristics of stress measured at the maximum load and the initial modulus of elasticity. Based on typical characteristics for both linerboard and corrugating medium material a design matrix is constructed for a factorial analysis. Using a computer, various stress-strain relationships are paired together like they might be on the corrugator, and the theoretical effects of the stress-strain characteristics are investigated. Computer drawn design curves show how these linerboard and medium characteristics affect combined board edgewise compressive strength and box top-to-bottom compressive strength. The interaction between the stress-strain characteristics and paperboard thickness is used to suggest new criteria for evaluating paperboard. Author (GRA)

N82-16185# Hercules, Inc., Magna, Utah. Aerospace Div.
THERMAL DEGRADATION OF GRAPHITE/EPOXY COMPOSITE Final Report, 16 Apr. 1979 - 30 Sep. 1980
Harold L. Pritt 28 Nov. 1980 70 p refs
(Contract N62669-79-C-0240)
(AD-A106425; NADC-78118-60) Avail: NTIS HC A04/MF A01 CSCL 11/4

The purpose of this effort was to develop visual, NDI, and residual strength correlations as a result of thermal degradation upon thick composite laminates. These investigations were performed upon dry 0.25-inch-thick, coated graphite composite (AS-1/3501-6) laminates subjected to thermal shock on one side. Exposure temperatures were 350 degrees, 400 degrees, 500 degrees, 600 degrees, 800 degrees, 1200 degrees, 1600 degrees, and 1800 degrees F. Temperature gradients were obtained from instrumental panels under no-load conditions. Thermal shocking of panels and specimens while under sustained strain (2500 microns in./in.) conditions provided comparisons of load carrying ability. Other specimens were tested for residual strength after thermal exposure. Ultrasonic examinations were performed, as was monitoring of color changes. Permanent matrix damage began to occur during a 600 degrees F exposure.
Author (GRA)

N82-16186# Aeronautical Research Labs., Melbourne (Australia).
NDI OF COMPOSITE MATERIALS
I. G. Scott and C. M. Scala Jul. 1981 30 p refs
(AD-A106278; ARL/MAT-TM-379) Copyright. Avail: Issuing Activity CSCL 11/4

A review is given of NDI methods for fibre-reinforced composite materials such as carbon, boron, glass and KEVLAR. The capabilities of present methods such as ultrasonics, radiography, holography and thermography are evaluated for defect detection. In addition, techniques which show promise of development as predictors of failure, e.g., vibration measurement and acoustic emission, are examined. Author (GRA)

N82-16187# Dayton Univ., Ohio.
NONLINEAR FINITE ELEMENT ANALYSIS OF SANDWICH COMPOSITES Final Report, Sep. 1977 - Nov. 1980
Robert A. Brockman Wright-Patterson AFB, Ohio AFWAL Mar. 1981 112 p refs
(Contract F33615-77-C-3075; AF Proj. 2401)
(AD-A106378; UDR-TR-80-113; AFWAL-TR-81-3008) Avail: NTIS HC A06/MF A01 CSCL 11/4

Finite element analysis techniques are developed for the solution of nonlinear problems involving sandwich composite materials. Each layer of a sandwich panel is represented explicitly so that multicore panels and other configurations are easily considered. The finite element discretization is performed using arbitrary-shaped, fully compatible shell and continuum elements, as well as special elements representing full-depth and/or face sheet stiffeners. Each of these elements is capable of representing arbitrarily large displacements and rotations, since no simplifying assumptions are made in the theoretical formulation. Elastic-plastic effects may also be considered. An associated computer program is described which may be used to perform linear or nonlinear solutions for mechanical and thermal loading, linear natural frequency calculations. Several example problems are solved to demonstrate the capabilities of the program.
Author (GRA)

N82-16188# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
ANALYSIS OF BONDED JOINTS IN COMPOSITE MATERIALS STRUCTURES INVOLVING HYGROTHERMAL EFFECTS Final Report, 1978 - 1979
Jack R. Vinson Apr. 1981 56 p refs
(Contract N00014-78-C-0199)
(AD-A106720; MAE-TR-239) Avail: NTIS HC A04/MF A01 CSCL 11/4

Results of the analyses of stresses, strains and displacements in both the adhesive bond and the adherends of bonded composite material structures and bonded metallic structures are presented. Joint configurations include the single lap, the double lap, the single doubler, the double doubler, and the stepped lap joint. The methods will be useful in designing and analyzing such joints under static, dynamic and thermal loads, as well as accounting for stresses incurred during fabrication as well as hygrothermal histories. Also shown are the effects of important geometric and material parameters on the stress, strain and displacement distributions. Author (GRA)

N82-16189# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.
INSTRUCTIONS FOR TI-59 COMBINED CARD/MODULE CALCULATIONS FOR IN-PLANE AND FLEXURAL PROPERTIES OF SYMMETRIC LAMINATES Final Report, May - Jul. 1981
Stephen W. Tsai and Stella D. Gates Sep. 1981 55 p
(AF Proj. 2419)
(AD-A107984; AFWAL-TR-81-4116) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report contains the description and instructions for the combined use of composite materials module and magnetic cards for TI-59 programmable calculators. These programs contain the key calculations of the stiffness and strength of unidirectional and laminated composites. This can include sandwich core laminates. Both in-plane and flexural loadings can be applied. With the combination of the module and magnetic cards, instant calculations can be made for practical use. With the use of a printer, these can be immediately outputted and recorded permanently. GRA

N82-16190# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
DEPOSITION AND CHARACTERIZATION OF PYROCARBON COATINGS PRODUCED BY USE OF CO2 DILUTION
D. P. Stinton and W. J. Lackey Oct. 1981 17 p refs
(Contract W-7405-eng-26)
(PB82-000900; ORNL/TM-7853) Avail: NTIS HC A02/MF A01 CSCL 11D

A Biso-coated fuel particle for the high temperature gas cooled reactor consists of a 500 micrometers ThO2 kernel, an 85 micrometer layer of low density carbon, and a 75 micrometer layer of high density pyrocarbon. Coatings produced from mixtures of 50% propylene, 25% CO2 and 25% Ar were found to be more gastight than were coatings produced from mixtures of propylene and argon, helium, or H2. Higher concentrations of CO2 in the gas mixture caused severe oxidation of graphite components within the coating furnace. The permeability of coatings deposited by use of CO2 dilution was found to depend on the deposition temperature. Low deposition temperatures produced more gastight coatings. It was determined that CO2 had little or no effect on coating anisotropy. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-16191# IBM Watson Research Center, Yorktown Heights, N.Y.
VIBRATIONAL OVERTONE SPECTROSCOPY OF BENZENE AND PYRIDINE ON Ag(111)
Ph. Avouris and J. E. Demuth Sep. 1981 17 p refs Submitted for publication
(Contract N00014-77-C-0366; NR Proj. 056-123)
(AD-A106396; TR-17) Avail: NTIS HC A02/MF A01 CSCL 07/3

Electron energy-loss results are presented which permit the detection of up to the fourth vibrational state of the CH stretching vibrations of benzene and pyridine adsorbed on Ag(111). A reduced anharmonicity is observed for adsorbed benzene while both alpha and beta, gamma-CH groups for pyridine can be observed. The life time for the V = 0 yields 4 vibrational excitation of benzene is estimated to be 2 x 10 to the -14 power sec. GRA

N82-16192# Alberta Univ., Edmonton. Dept. of Chemistry.
VIBRATIONAL SPECTROSCOPY OF THE ELECTRODE-ELECTROLYTE INTERFACE. USE OF FOURIER TRANSFORM INFRARED SPECTROSCOPY
Timothy Davidson, B. Stanley Pons (Southampton Univ.), Alan Bewick, and Parbury P. Schmidt (Oakland Univ.) 1 Aug. 1981 20 p refs Submitted for publication

(Grant N00014-80-G-0107; NR Proj. 359-718)
(AD-A106231; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Reported is the first application of Fourier transform infrared spectroscopy as an analytical probe for the in situ monitoring of electrochemical interfacial phenomena. The structure of acetonitrile at the interface is reported. Author (GRA)

N82-16193# Brown Univ., Providence, R. I. Dept. of Chemistry.
PREPARATION AND CHARACTERIZATION OF CONDUCTING IRON TUNGSTATES
H. Leiva, K. Dwight, and Aaron Wold 23 Oct. 1981 26 p refs Submitted for publication
(Contract N00014-77-C-0387; NR Proj. 359-653)
(AD-A106541; TR-17) Avail: NTIS HC A03/MF A01 CSCL 07/2

Several iron(III) tungstates have been prepared, and their crystallographic, magnetic, electric and photoelectronic properties have been characterized. The compounds crystallize with the tri-alpha-PbO2 structure, and the actual ordering of the MO6 octahedra (M = Fe or W) appears to determine these properties. Under illumination, Fe2WO6 photoanodes show an intermediate photoresponse between conducting alpha-Fe2O3 and WO3, although the flat-band potential is still too positive.
Author (GRA)

N82-16194# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FEASIBILITY OF INTERFACING A MICROCOMPUTER WITH A MULTICHANNEL ANALYZER TO PERFORM GAMMA RAY SPECTROSCOPY M.S. Thesis
DeFrance Clarke, III Mar. 1981 140 p refs
(AD-A106176; AFIT/GNE/PH/81M-2) Avail: NTIS HC A07/MF A01 CSCL 20/8

Interfacing a microcomputer to a Nuclear Data Series 2200 multichannel analyzer has been demonstrated. Programs for data transfer, peak detection, peak net area integration, peak centroid location, and energy calibration were written. Data transfer and peak detection scan were demonstrated on 4096 channel spectra in less than 5 minutes. Multibyte integer arithmetic routines for the 8080 microprocessor were written to conserve space and time. A proposed system for gamma ray spectrum analysis is described in hardware and software terms. The hardware for the proposed system would cost less than $9000 while commercial multichannel analyzers with the same capabilities would cost in excess of $23,000. GRA

N82-16195# Alberta Univ., Edmonton. Dept. of Chemistry.
REDUCTIONS IN APROTIC MEDIA. 1: CATHODIC REDUCTION LIMITS IN ACETONITRILE AT A PLATINUM ELECTRODE
B. Stanley Pons and S. B. Khoo 15 Aug. 1981 43 p refs
(Contract N00014-80-C-0107)
(AD-A106815; TR-6) Avail: NTIS HC A03/MF A01 CSCL 09/1

The cathodic behavior of acetonitrile of a platinum electrode is strongly dependent on the cation of the supporting electrolyte, and contamination by moisture. Hydride ion is formed at negative potentials in anhydrous solutions. Author (GRA)

N82-16196# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
CARBON VAPOR PRESSURE IN THE RANGE 3450 TO 4500 K AND EVIDENCE FOR MELTING AT APPROXIMATELY 3800 K
Arthur G. Whittaker, Paul I. Kinter, L. S. Nelson (Sandia Corp., Albuquerque, N. Mex.), and N. Richardson (Sandia Corp., Albuquerque, N. Mex.) 1 Sep. 1981 57 p refs
(Contract F04701-80-C-0081)
(AD-A106134; TR-0081(6950-02)-1; SD-TR-81-60) Avail: NTIS HC A04/MF A01 CSCL 07/3

The vapor pressure of carbon was determined over the temperature range 3470 to 4490 K by using a laser heating technique. The solid-liquid-vapor triple point was located at approximately 3800 K and a pressure of approximately 13,000 Pa, and the normal boiling point was found to be approximately 4140 K. Evidence for a solid-solid-vapor triple point was found at approximately 3560 K. Liquid carbon was produced in a free state, and some of its properties were determined. Superheated liquid carbon was produced at low pressure by using sufficient laser power. Spectroscopic methods were used to determine the carbon gas temperature and as a cross-check on the temperature determined by an optical pyrometer. Author (GRA)

N82-16197# Naval Research Lab., Washington, D. C.
CONSTRUCTION OF LARGE REACTION MECHANISMS Final Report
D. Indritz, M. Maday, R. Sheinson, and W. Shaub 9 Oct. 1981 30 p refs
(RR0240241)
(AD-A106139; NRL-8498) Avail: NTIS HC A03/MF A01 CSCL 07/4

An algorithm was developed to systematically and objectively generate tractable reaction mechanisms using as input information the species present, and their enthalpies, entropies, number of atoms, and number of bonds. The algorithm generates all possible reactions subject to the constraints of mass balance, energy, entropy, and number of bonds broken and formed. Bimolecular, unimolecular decomposition, addition and isomerization reactions are considered. This method reduces error and still allows for the application of chemical intuition by the researcher. GRA

N82-16198# University of Southern California, Los Angeles.
REACTIVE AND ENERGY TRANSFER PROCESSES OF THE NEUTRAL RADICAL SPECIES HgBr IN GAS PHASE COLLISIONS Final Technical Report, May 1978 - May 1981
H. Helvajian and C. Wittig 5 Nov. 1981 52 p refs
(Contract N00014-78-C-0585)
(AD-A107718) Avail: NTIS HC A04/MF A01 CSCL 20/3

Experimental investigations were conducted wherein kinetic process associated with the gas phase radical species HgBr were studied. These studies serve to provide pertinent information about the development of the blue-green HgBr (B yields X) laser. The experiments utilize laser induced fluorescence and/or chemiluminescence as a means for observing the collisional behavior of HgBr radicals. GRA

N82-16199# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.
DETERMINATION OF YTTRIUM IN HIGH DENSITY SILICON NITRIDE BY EMISSION AND X-RAY FLUORESCENCE SPECTROSCOPY Final Report
Bernard H. Strauss Aug. 1981 15 p
(AD-A107596; AMMRC-TR-81-39) Avail: NTIS HC A02/MF A01 CSCL 07/4

Two spectrographic methods were developed for the determination of yttrium in high density yttrium-doped silicon nitride. The first method employs emission spectrographic techniques which compares a solution of the dissolved sample with that of aqueous synthetic standards. The second method uses energy dispersive X-ray fluorescence techniques to compare fusion buttons made from the samples with those fabricated from pure yttria and undensified silicon nitride. Synthetic standards were required in both methods because there were no available yttrium-densified silicon nitride standards. Seven samples were analyzed whose yttrium content ranged from two to sixteen weight percent. Data on results are furnished. GRA

N82-16200# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va. Fuels and Lubricants Div.
IDENTIFICATION OF SYNTHETIC FLUIDS UTILIZING PYROLYSIS GAS LIQUID CHROMATOGRAPHIC TECHNIQUES Final Report
Robert G. Jamison Sep. 1981 47 p refs
(AD-A108117; MERADCOM-2340) Avail: NTIS HC A03/MF A01 CSCL 11/8

Because of the increasing use of synthetic-based lubricants and functional fluids, a study was initiated to develop a rapid gas liquid phase chromatographic method that would enable qualitative identification of differing types of base stock ingredients. Results of this investigation revealed that by utilizing pyrolysis gas liquid-phase chromatographic techniques, identification of many different types of materials can be successfully accomplished

in a relatively short period of time. Utilization of this technology will greatly enhance the resolution of field problems and permit a greater understanding of fluid and lubricant research.
Author (GRA)

N82-16201# Sandia Labs., Albuquerque, N. Mex.
OXIDATION OF POLYCRYSTALLINE BORON: THE INTERPRETATION OF AES AND ELS RESULTS
J. E. Rogers, Jr. and M. L. Knotek 1981 6 p refs Presented at Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-000087; SAND-81-1487C; CONF-811113-13) Avail: NTIS HC A02/MF A01

The asymmetrical shape of the high energy side of the B (KVV) transitions accompanying surface oxidation indicates a superposition of clean and oxide derived features. Two maxima are resolved at 164 and 154 eV; a shoulder is present at 141 eV. Energy loss spectroscopy loss peaks in oxidized boron are at 4, 8.6, 10.8, 16.7, 23.1, and 36 eV; they are interpreted. DOE

N82-16202# Los Alamos Scientific Lab., N. Mex.
APPLICATIONS OF DHDECMP EXTRACTION CHROMATOGRAPHY TO NUCLEAR ANALYTICAL CHEMISTRY
S. F. Marsh and O. R. Simi 1981 10 p refs Presented at the 25th Conf. on Anal. Chem. in Energy Technol., Gatlinburg, Tenn., 6-8 Oct. 1981
(Contract W-7405-eng-36)
(DE81-030134; LA-UR-81-2533; CONF-811025-1) Avail: NTIS HC A02/MF A01

Dihexyl-N,N-diethylcarbamyl methylene phosphonate (DHDECMP) is a highly selective extractant for actimides and lanthanides. This reagent, extensively studied for process-scale operations, also has valuable analytical applications. Extraction chromatographic columns of DHDECMP, supported on inert, porous, polymer beads effectively separate most metallic impurity elements from the retained transition elements. The retained elements can be separated into individual fractions of lanthanides, americium, plutonium, and uranium by mixed-solvent anion exchange. DOE

N82-16203# Brookhaven National Lab., Upton, N. Y.
AIR DESORPTION FROM A WATER FILM
D. Edwards, Jr. 1981 7 p ref Presented at the Am. Vacuum Soc. Natl. Symp. Anaheim, Calif., 2-6 Nov. 1981
(Contract DE-AC02-76CH-00016)
(DE81-031961; BNL-30100; CONF-811113-15) Avail: NTIS HC A02/MF A01

The thermal desorption of air cryotrapped in a water film is reported. In addition, the non-effect of pure water overlayers is observed. The practical implication is that this type of system could be able to be used as a pump of air in a vacuum system. DOE

N82-16204# California Univ., Livermore. Lawrence Livermore Lab.
FLAME INHIBITION BY METHYL BROMIDE
Charles K. Westbrook 27 Aug. 1981 34 p refs Presented at Western States Sec. of the Combust. Inst., Tempe, Ariz., 19-20 Oct. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030995; UCRL-86456; CONF-811041-1) Avail: NTIS HC A03/MF A01

A numerical flame model is used to investigate the inhibition of laminar hydrocarbon-air and hydrocarbon-oxygen flames by methyl bromide. The detailed kinetic mechanism consists of 97 elementary reactions involving 30 chemical species and is based on a previous model for flame inhibition by HBr to which have been added reactions in which Br atoms are abstracted from CH3Br. The resulting mechanism is validated by comparison between experimental data on low pressure CH4-O2-CH3Br flames. Subsequently, the model is used to predict the response of a series of fuel-air mixtures to the addition of varying amounts of CH3Br. Fuels considered include methane, methanol, and ethylene. It is found that the inhibition efficiency depends on fuel-air equivalence ratio, pressure and fuel type. The kinetic factors responsible for this behavior are discussed in detail. DOE

N82-16205# Tennessee Technological Univ., Cookeville. Dept. of Chemical Engineering.
CONVERSION OF ORNL WASTE PAPER TO SUGAR USING ACID HYDROLYSIS
E. C. Clausen, A. H. Shah, P. R. Saggurti, W. P. Teichert, and M. E. Harrison 1981 34 p refs Presented at the 7th Ann. Meeting of Am. Inst. of Chem. Eng., New Orleans, Nov. 1981
(Contract W-7405-eng-26)
(DE82-000462; K/SUB-80-7994/1; CONF-811108-5) Avail: NTIS HC A03/MF A01

The Oak Ridge National Laboratory generates large quantities of waste paper that is presently being landfilled. Three processes were investigated in the laboratory for acid hydrolyzing this waste paper to glucose which may be later fermented to ethanol for fuel. Laboratory yields and operating conditions for a high temperature dilute acid process, a concentrated acid process and a process which utilizes waste acid are presented. DOE

N82-16206# Los Alamos Scientific Lab., N. Mex.
EXPERIMENTAL WORK RELATED TO TWO BISMUTH SULFATE CYCLES AND THEIR POSSIBLE IMPROVEMENT. OUTLINE OF A POSSIBLE ANTIMONYL SULFATE CYCLE WITH SEPARATE EVOLUTION OF SULFUR DIOXIDE AND OXYGEN
Wesley M. Jones 1981 10 p refs Presented at the 4th Tech. Workshop (Task 1), Thermochem. Processes, Juelich, West Germany, 23-25 Sep. 1981 Submitted for publication
(Contract W-7405-eng-36)
(DE81-030236; LA-UR-81-2627; CONF-810942-4) Avail: NTIS HC A02/MF A01

The key reactions of both cycles are listed. Cycle 1 proceeds through the intermediate oxysulfates Bi2O2(SO4)2 and Bi2O2SO4 and Cycle 2 through Bi2O2SO4. Cycle 1 has the advantage of generating 2.3 moles of H2 per mole of Bi2O3, compared with 1.3 for Cycle 2. The efficiency for electrochemical formation of H2SO4 and H2 seems at present to be a maximum at around 30 wt% H2SO4. Thermodynamic data obtained for the decomposition reactions are presented. A possible improvement in these cycles is discussed which may provide a solution to a problem of sorption of H2SO4 solution by the solids and might allow use of a more dilute acid than in Cycle 1 above. A brief discussion on the possible simplification of the SO3-SO2-O2 separation problem with a sulfuric acid-antimonly sulfate hybrid cycle is presented. DOE

N82-16207# Mound Lab., Miamisburg, Ohio.
SURFACE STUDIES OF PLASTIC-BONDED PETN AND RDX BY X-RAY PHOTOELECTRON SPECTROSCOPY (XPS) AND ION-SCATTERING SPECTROSCOPY (ISS)
P. S. Wang, W. E. Moddeman, L. D. Haws, T. N. Wittberg (Dayton Univ.), and J. A. Peters (Dayton Univ.) 1981 25 p refs Presented at 11th Symp. on Explosives and Pyrotech., Philadelphia, 15 Sep. 1981
(Contract DE-AC04-76DP-00053)
(DE81-030402; MLM-2860-OP; CONF-810926-5) Avail: NTIS HC A02/MF A01

Surface structures of plastic bonded PETN and RDX were studied by high resolution X-ray Photoelectrons Spectroscopy (XPS) and Ion Scattering Spectroscopy (ISS). The coating material is a copolymer of vinyl chloride and chlorotrifluoroethylene. Specimens with 6 wt % of the coating on RDX and 4 wt % on PETN were used in these studies. High resolution elemented XPS spectra of F 1s, N 1s, C 1s, and Cl 2p indicate that the surface of coated RDX (PBX-9407) is covered and the coating film is thicker than 100A; the results with coated PETN (LX-16) show the surface layer to be thinner than 100A. He(+) ISS data on LX-16 suggest that the coating on PETN is not uniform and is, in fact, absent in some regions. DOE

N82-16208# Harvard Medical School, Boston, Mass. Dept. of Pharmacology.
SMALL UNILAMELLAR VESICLES AS REAGENTS: A CHEMICALLY DEFINED QUANTITATIVE ASSAY FOR LECTINS
Robert K. Rando 1981 17 p refs
(Contract DE-AC02-79EV-10208)
(DE81-030365; DOE/EV-10268/2) Avail: NTIS HC A02/MF A01

Small unilamellar vesicles containing synthetic glycolipids can be prepared. These vesicles are aggregated by the appropriate lectin (Orr et al., 1979; Rando and Bangerter, 1979; Slama and Rando, 1980). It is shown here that extent of aggregation of these vesicles as measured by light scattering at 360 nm, is, under certain conditions, linear with amount of lectin added. This forms the basis of a rapid and simple quantitative assay for lectins using the modified vesicles as a defined chemical substrate. The assay is sensitive to lectin concentrations in the low microgram range. The assay is applied here to studies on concanavalin A, Ricinus communis agglutinin and the alpha fucosyl binding lectin from Ulex europaeus (Type I). DOE

N82-16209# Electrochimica Corp., Mountain View, Calif.
STUDY OF THE SECONDARY Li ELECTRODE IN ORGANIC ELECTROLYTE Final Report, 15 Jun. 1980 - 28 Feb. 1981
M. Eisenberg Apr. 1981 45 p refs Prepared for California Univ., Berkeley. Lawrence Berkeley Lab.
(Contract W-7405-eng-48)
(DE82-001508; LBL-13263) Avail: NTIS HC A03/MF A01

The objective of this eight month program was a preliminary Phase I study of the electrochemical and morphology aspects of lithium anode rechargeability in organic electrolyte ambient temperature systems. It is now increasingly recognized that the limitation of lithium anode rechargeability may have a serious effect on the future development and capabilities of ambient temperature high energy secondary lithium batteries. To provide a basis for future reliable evaluation of electrolyte systems, it was necessary to examine the technique of stripping efficiency studies for lithium with particular reference to the effect of substrates, amount of charge passed, current density and other conditions. Next was a development of a technique for lithium electrode preparation for electrodeposition for scanning electron microscopy (SEM) studies. With these techniques, a number of basic electrolyte systems were examined in order to elucidate directions in which future efforts in this area should be made. DOE

N82-16210# Cities Service Research and Development Co., Tulsa, Okla.
FLASH HYDROPYROLYSIS OF WESTERN KENTUCKY NO. 9 BITUMINOUS COAL WITH CATALYST Final Technical Progress Report
31 Mar. 1981 254 p refs
(Contract DE-AC22-79ET-14943)
(DE81-029631; DOE/ET-14943/T1) Avail: NTIS HC A12/MF A01

The effects of selected catalysts on liquefaction of caking and noncaking pulverized coals were investigated. With caking coals, the free fall flash hydropyrolysis reactor operated satisfactorily between temperatures of 1250 to 1550 F and between 900 to 950 F with and without catalyst additions. Noncaking coals could be treated at all ranges of temperatures with or without catalyst additions. Up to two pounds per hour of coal and four pounds per hour of hydrogen were fed into the reactor. Of the catalysts tested, zinc chloride proved most effective, but only at low temperature of about 900 F. At temperatures of 1250 to 1450 F, zinc chloride, as well as other catalysts, proved to be ineffective. At 1400 to 1450 F and 1000 psig with 0.5 seconds solids residence time, about 47 percent of the carbon in caking coals were converted into useful gas and liquid products: 10 percent BTX, 7 percent light oil, 10 percent heavy oil, 27 percent total oil, 12 percent methane, 8 percent ethane, and 20 percent total gas. DOE

N82-16211# Minnick (L. John), Plymouth Meeting, Pa.
DEVELOPMENT OF POTENTIAL USES FOR THE RESIDUE FROM FLUIDIZED-BED-COMBUSTION PROCESSES Quarterly Technical Progress Report, Mar. - May 1981
L. John Minnick 1981 30 p
(Contract DE-AC21-77ET-10415)
(DE81-030157; DOE/ET-10415/T4) Avail: NTIS HC A03/MF A01

Evaluation of the solid wastes from fluidized bed combustion for potential commercial uses is described. Methods by which the material can be safely disposed of should commercial applications be slow in developing were explored. It was shown that spent bed materials from atmospheric fluidized bed (AFB) boilers are potentially useful in a number of commercial applications. AFB residue materials from different sources do contain a substantial component of reactive lime which can, after proper processing, be concentrated and effectively separated from the residue. Spent bed materials also exhibit unusual cementitious properties when used as received or after processing in certain construction related compositions. Evaluation of a number of different sources of AFB residue in the following areas of research was emphasized in the study: (1) characterization of AFB by-product materials; (2) determination of most effective means of beneficiation or separation of materials; (3) laboratory evaluation of the feasibility for use of AFB residue in such applications as a lime substitute, neutralization of acidic trade wastes, flue gas desulfurization, and the stabilization of highly plastic soils; and (4) performance testing of commercial applications involving some cementitious activity. M.D.K.

N82-16212# Montana State Univ., Bozeman. Dept. of Chemical Engineering.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Jun. - Aug. 1981
L. Berg Sep. 1981 37 p
(Contract DE-AC22-76ET-10495)
(DE82-003250; DOE/ET-10495/T3) Avail: NTIS HC A03/MF A01

The development of special catalysts to convert SRC-II into a feedstock acceptable to a conventional petroleum refinery proceeded with the carrying out of several long cycle runs. A catalyst comprising 4% CoO, 8% MoO3, 1% NiO and 8% WO3 on NALCO base 78-6008 was operated for 102 hours with burnoffs and resulfiding every three hours. The same catalyst was operated for 104 hours with regeneration every eight hours. This catalyst was then operated for runs of 60, 100 and 300 hours with no burnoff. Harshaw's HT400 with 15% MoO3 and 3% coO was operated for a single cycle of 165 hours before cogeneration. These runs produced typically liquid yields of 90 to 100 vol. %, < 0.3 wt. % N2 and < 0.3 wt. % S in the product, and a yield of 45% of 40 to 2050 C. gasoline prossessing octane numbers of 75.1 MON, 88.3 RON, 81.7 (R+M)/2. A study of regeneration via burnoff and resulfiding showed a slight reduction in the size of the pores of the catalyst. Catalysts were prepared by impregnating 4% coO, 2% MoO3 and 2% WO3 on seven different bases having pore diameters ranging from 90A to 420A. These catalysts as well as the unimpregnated bases were evaluated for denitrogenation ability with SRC-II. Preliminary results point to the 220A pore diameter as the best compromise between diffusion limitation and reduction in surface area. DOE

N82-16213# Washington State Univ., Pullman. Dept. of Mechanical Engineering.
CHARACTERISTICS OF COAL/LIGHT HYDROCARBON SLURRIES IN SPRAY COMBUSTION Semiannual Progress Report, 1 Mar. - 31 Aug. 1981
W. L. Grosshandler, Clayton T. Crowe, and Jacob N. Chung Sep. 1981 23 p refs
(Contract DE-FG22-80PC-30216)
(DE82-000387; DOE/PC-30216/T2) Avail: NTIS HC A02/MF A01

The status of the atomization process, recirculation within the droplet, and the combustion of coal/vaporized fuel in a diffusion burner is discussed. The droplet spray apparatus was completed and checked out for mixing effectiveness and spray uniformity. Initial runs with pure methanol were completed. Preliminary tests were run with slurries composed of 15% and 30% mixtures of coal in liquid with mean particle sizes of 50 and 150 (Sigma)m. Analysis of the data shows small increases in Sauter mean diameter due to the presence of coal particles. The equations of motion for coal particles translating inside a circulating light hydrocarbon were developed. A computer program has been written to solve for the particle motion numerically. Particle trajectories and general distribution patterns are predicted. The combustion facility was designed and built. Initial testing to assess the stability and flatness of the reaction zone is described. Both a spouted bed and fluidized bed feeder were built to control the mass flow of coal to the burner, and the stability and flow rate of each are being assessed. DOE

N82-16214# OPTO-Elektronische Instrument G.m.b.H. und Co K.G., Karlsruhe (West Germany).
DEVELOPMENT OF A PARTICLE COLLECTOR FOR ABSOLUTE MEASUREMENTS OF PARTICLE FORM, PARTICLE SIZE AND PARTICLE CONCENTRATION Final Report, Aug. 1979
Rolf Kleine and Siegbert Bittighofer Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 54 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-029; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9.90

A particle collector system in which the collecting element is constituted by copper oxide whiskers grown on fine meshed and highly transparent bronze wire grids was developed. An absolute determination of size and shape is provided By electron microscope imagery of the meshes onto which liquid droplets or solid particles adhesively stick. The whisker growing technique and the automated picture analysis method are described. Section probes and pump units were developed for isokinetic sampling. It is indicated that the whisker collectors are suited for analyzing fine aerosols below 1 micron and that they can be used for absolute calibration of optical particulate sampling instruments. Author (ESA)

N82-16215# National Bureau of Standards, Washington, D.C. Center for Fire Research.
SMOLDERING COMBUSTION HAZARDS OF THERMAL INSULATION MATERIALS Interim Report, 1 Oct. 1979 - 30 Apr. 1981
T. J. Ohlemiller Aug. 1981 69 p refs Sponsored in part by ORNL, Tenn.
(PB82-107046; NBSIR-81-2350) Avail: NTIS HC A04/MF A01 CSCL 13M

The smoldering combustion hazards of cellulosic loose fill insulation materials (smolder initiation, smolder propagation and transition from smoldering into flaming) were investigated. An improved smolder ignition test method is being designed to give ignition temperatures comparable to those in practice. The test method requires checking against full-scale mock-up results before implementation. Analysis of experimental profiles for temperature, oxygen level, and remaining organic fraction strongly indicate that the smolder wave is oxygen supply controlled and involves both first and second stages of oxidative heat release from the insulation material. Efforts to develop improved means of suppressing smolder propagation should be directed at the entire oxidation process. M.D.K.

N82-17074*# Athens Coll., Ala. Dept. of Biology.
DESIGN CONSIDERATIONS OF A THERMALLY STABILIZED CONTINUOUS FLOW ELECTROPHORESIS CHAMBER 2
Thomas S. Jandebeur *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 6 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07D

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-16216*# Miami Univ., Coral Gables, Fla. Dept. of Mechanical Engineering.
EFFECTS OF ENVIRONMENTAL VARIABLES ON THE CRACK INITIATION STAGES OF CORROSION FATIGUE OF HIGH STRENGTH ALUMINUM ALLOYS Final Report
Laurence E. Poteat 18 Dec. 1981 26 p refs
(Grant NsG-1283)
(NASA-CR-165115) Avail: NTIS HC A03/MF A01 CSCL 11F

Fatigue initiation in six aluminum alloys used in the aircraft industry was investigated. Cyclic loading superimposed on a constant stress was alternated with atmospheric corrosion. Tests made at different stress levels revealed that a residual stress as low as 39% of the yield strength caused stress corrosion cracking in some of the alloys. An atmospheric corrosion rate meter developed to measure the corrosivity of the atmosphere is described. An easily duplicated hole in the square test specimen with a self-induced residual stress was developed. J.D.H.

N82-16217# Systems Research Labs., Inc., Dayton, Ohio.
CHARACTERIZATION OF MICROSTRUCTURES Final Report, 1 May 1977 - 1 Oct. 1980
Allen G. Jackson, Ralph E. Omlor, Richard J. Bacon, M. Brewster Strope, Pamela F. Lloyd, Robert D. Brodecki, Walter J. Custer, Fritz O. Deutscher, J. Cheryl Conley, and James G. Paine Wright-Patterson AFB, Ohio AFWAL May 1981 92 p refs (Contract F33615-77-C-5008; AF Proj. 2418)
(AD-A106351; SRL-6945; AFWAL-TR-81-4047) Avail: NTIS HC A05/MF A01 CSCL 11/6

Research related to the characterization of microstructures of various metallic and nonmetallic materials is summarized. Metals included aluminum alloys, titanium alloys, nickel-base superalloys, nonmetallics such as graphite fibers and polymers, titanium matrix composites and ceramics (TiC, sialons). Techniques employed were various types of electron microscopy (TEM, SEM, EPMA), optical microscopy, quantitative metallography, and various heat treatments. Improvements in techniques were made in each method applied. Major subprojects included characterization of titanium powders, examination of Ti-5Al-2.5Sn PM alloy, formulation of a color micrograph method for titanium-hydride determination, and use of new microcomputer methods for stereological analyses of microstructures. The Materials Characterization Facility is described in terms of the physical plant and the methods of operation used in accomplishing the research on microstructures. Author (GRA)

N82-16218# Naval Ship Research and Development Center, Bethesda, Md. Ship Materials Engineering Dept.
AN EXPERIMENTAL EVALUATION OF TEARING INSTABILITY USING THE COMPACT SPECIMEN Final Report
Michael G. Vassilaros and James A. Joyce Nov. 1981 30 p refs
(AD-A107633; DTNSRDC-81/029) Avail: NTIS HC A03/MF A01 CSCL 20/11

The objective of this investigation was to produce experimental verification of the tearing instability theory proposed by Paris and coworkers. This theory states that ductile crack extension will occur in an unstable fashion whenever the applied tearing force is greater than the material tearing resistance. In this investigation, a series of compact specimens of aluminum, titanium, and steel alloys were tested in a variably compliant test machine to generate a range of applied tearing forces. The material tearing resistance was measured from the JI-R curves of the stable specimens and compared to the applied tearing force necessary to generate ductile tearing instability in each material. The Paris theory was found to accurately predict the onset of gross instability behavior. Some limited instability behavior was found, however, at values of tearing force less than the average material tearing resistance obtained from an unloading compliance JI-R curve test. Limited instability behavior was characterized by repeated short steps of rapid but ductile crack extension, separated by regions of slow stable tearing.
Author (GRA)

N82-16219# Oak Ridge National Lab., Tenn.
SWELLING AND MICROSTRUCTURE OF HFIR IRRADIATED AUSTENITIC STAINLESS STEELS
P. J. Maziasz 1980 16 p Presented at the ADIP Program Rev. Meeting, Germantown, Md., 30 Sep. - 1 Oct. 1980
(Contract W-7405-eng-26)
(DE82-000158; CONF-8009179-3) Avail: NTIS HC A02/MF A01

The swelling and microstructural information available from HFIR-CTRs-9-13 are summarized and compared for CW 316 and CW(316 + TI). These experiments were irradiated to moderate fluences of about 8 to 16 dpa and 500 to 1000 at. ppM He at irradiation temperatures ranging from 285 to 670 C. The results are compared to higher fluence HFIR irradiation of CW 316 from HFIR-CTRs-2-8 irradiated at 375 to 680 C at fluences up to 61 dpa and 4200 at. ppM He. Both the high- and low-fluence cavity volume fraction swelling curves for CW 316 have a similar shape. The curves show a definite swelling minimum at 470 to

570 C that corresponds to the temperature of maximum precipitation. The swelling increases rather sharply with temperature at the higher and lower temperatures. The moderate fluence swelling levels are all below 0.5% Delta V/V sub o.DOE

N82-16220# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

TENSILE PROPERTIES AND MIROSTRUCTURE OF HELIUM-INJECTED AND REACTOR-IRRADIATED V-20 Ti

M. P. Tanaka, E. E. Bloom, and J. A. Horak 1981 16 p Presented at the ADIP Program Rev. Meeting, Germantown, Md., 30 Sep. - 1 Oct. 1980

(Contract W-7405-eng-26)

(DE81-032005; CONF-8009179-4) Avail: NTIS HC A02/MF A01

The effect of preinjected helium followed by neutron irradiation on the mechanical properties and microstructure of V-20% Ti was determined. DOE

N82-16221# Oak Ridge National Lab., Tenn.

RESISTANCE OF (Fe,Ni)SUB3V LONG-RANGE-ORDERED ALLOYS TO RADIATION DAMAGE

D. N. Braski 1980 18 p Presented at the ADIP Program Rev. Meeting, Germantown, Md., 30 Sep. - 1 Oct. 1980

(Contract W-7405-eng-26)

(DE81-032006; CONF-8009179-5; ORNL/DWG-80-17709) Avail: NTIS HC A02/MF A01

The (Fe,Ni)3V long-range-ordered (LRO) alloys being developed for possible application as a first-wall material for a fusion reactor are considered. Alloys with different Fe/Ni ratios were screened to their resistance to radiation by irradiating them with 4 MeV Ni ions to 70 dpa at temperatures from 525 to 680 C. Helium (8 at ppM/dpa) and deuterium ions (28 at ppM/dpa) were simultaneously injected to better simulate fusion reactor conditions. Alloy LRO-16 (31 wt% Ni) contained sigma phase and showed swelling behavior similar to the 20% cold-worked 316 stainless steel that was used as an internal standard. Alloy LRO-20 (39.5 wt% Ni), without sigma phase, swelled slightly less than the 316 stainless steel. Both alloys demonstrated noticeably lower swelling behavior when their composition was changed to include 0.4 wt% Ti. DOE

N82-16222# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

INFLUENCE OF IRRADIATION ON THE TENSILE PROPERTIES OF AUSTENITIC STAINLESS STEEL WELDMENTS

F. W. Wiffen, D. P. Edmonds, J. A. Horak, and J. F. King 1980 17 p Presented at the ADIP Program Rev. Meeting Mater. and Radiation Effects Branch, Germantown, Md., 30 Sep. - 1 Oct. 1980

(Contract W-7405-eng-36)

(DE81-032002; CONF-8009179-6) Avail: NTIS HC A02/MF A01

Weldments in the first wall and front sections of the blanket of a fusion reactor will be exposed to approximately the same operating conditions as will the base metal. Thus the irradiation response of weld metal, of the weld heat affected zones in the base metal, and of the base metal are all of equal concern. Austenitic stainless steels will most likely be joined by a gas tungsten arc welding process. Welds were made by this process between sections of 6-mm-thick (0.25 in.) base plate of type 316 in the 20%-cold-worked condition, with either type 316 or 16-8-2 stainless steel filler metal. Rod tensile specimens were cut through the welds, containing weld metal in the central gage portion. Weld-containing tensile specimens were irradiated at 55 C and throughout the temperature range 280 to 620 C. The displacement damage levels range from 4.5 to 12.1 dppa, and the helium generation from the thermal neutron captures in nickel resulted in 100 to 550 at ppM He. DOE

N82-16223# Hanford Engineering Development Lab., Richland, Wash.

VOID SWELLING IN THE MOLYBDENUM ALLOY TZM IRRADIATED TO HIGH FLUENCES

D. S. Gelles, D. T. Peterson, and J. F. Bates 1981 6 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9-12 Aug. 1981

(Contract DE-AC14-76FF-02170)

(DE81-029802; HEDL-SA-2336-FP; CONF-810831-41) Avail: NTIS HC A02/MF A01

Microstructural development and density change measurements are reported for TZM, a commercial molybdenum base alloy, following fast neutron irradiation in EBR-2 to high fluence over the temperature range 400 C to 650 C. Uniformly distributed voids arrayed in a lattice and constituting 3% swelling were observed following irradiation at 650 C to 14.7 x 10 to the 22nd power n/sq cm (E > 0.1 MeV) (53 dpa). Nonuniformly distributed rafts of voids in lattice arrays were observed following irradiation at 540 C to 13.6 x 10 to the 22nd power n/sq cm Void swelling was not resolved following irradiation at 425 C to 12.2 x 10 to the 22nd power n/sq cm. Void swelling measurements corroborated density change results which showed peak void swelling behavior saturating at 590 C. Two mechanisms for the behavior observed are considered. DOE

N82-16224# Hanford Engineering Development Lab., Richland, Wash.

FRACTURE TOUGHNESS TESTING ON FERRITIC ALLOYS USING THE ELECTROPOTENTIAL TECHNIQUE

F. H. Huang and G. L. Wire 11 Jun. 1981 19 p refs Presented at Fusion Reactor Mater. Meeting, Seattle, 9-12 Aug. 1981

(Contract DE-AC14-76FF-02170)

(DE81-029776; HEDL-SA-2474-FP; CONF-810831-43) Avail: NTIS HC A02/MF A01

Fracture toughness measurments as done conventionally require large specimens (5 x 5 x 2.5 cm) which would be prohibitively expensive to irradiate over the fluence and temperature ranges required for first wall design. To overcome this difficulty a single specimen technique for J integral fracture toughness measurements on miniature specimens (1.6 cm OD x 0.25 cm thick) was developed. Comparisons with specimens three times as thick show that the derived J sub Ic is constant, validating the specimen for first wall applications. The electropotential technique was used to obtain continuous crack extension measurements, allowing a ductile fracture resistence curve to be constructed from a single specimen. The irradiation test volume required for fracture toughness measurements using both miniature specimens and single specimen J measurements was reduced a factor of 320, making it possible to perform a systematic exploration or irradiation temperature and dose variables as required for qualification of HT-9 and 9Cr-1Mo base metal and welds for first wall application. Fracture toughness test results for HT-9 and 9Cr-1 Mo from 25 to 539 C are presented to illustrate the single specimen technique. DOE

N82-16225# General Atomic Co., San Diego, Calif.

EFFECT OF MICROSTRUCTURE ON THE MECHANICAL PROPERTIES OF A COMMERCIAL 12Cr-1Mo STEEL (HT-9)

Thomas A. Lechtenberg Aug. 1981 6 p refs Presented at Fusion Reactor Mater. Meeting, Seattle, 9-12 Aug. 1981 Submitted for publication

(Contract DE-AT03-76ET-51011; GA Proj. 3235)

(DE82-000082; GA-A-16339; CONF-810831-57) Avail: NTIS HC A02/MF A01

The microstructure of a commercial 12CR1Mo steel (HT-9) and its associated effect on strength and toughness properties is studied in order to qualify the alloy for use in fusion energy machines. Interim results show this alloy is subject to a degree of tempered martensite embrittlement and temper embrittlement. For applications projected for fusion machines at lower temperatures, a heat treatment (1000 C, 1 h, air cooled followed by 650 C tempering) at lower temperatures and is shorter times than the vendor recommended heat treatment is identified. Microstructural differences between the treatments are discussed, and mechanical properties are correlated. DOE

N82-16226# Department of Atomic Energy, Bombay (India).

PROCEEDINGS OF THE INTERDISCIPLINARY MEETING ON HYDROGEN IN METALS

1980 325 p refs Meeting held at Bombay, 19-20 Feb. 1980

(DE81-904020; CONF-800280) Avail: NTIS HC A14/MF A01

Hydrogen embrittlement of steels and titanium, nickel, and zirconium alloys was investigated. Neutron scattering studies of

hydrogen-metal systems and hydrogen diffusion in metals were discussed. The role of hydrogen in stress corrosion cracking was considered. Methods for determination of hydrogen in metals were described. DOE

N82-16227# LaQue Center for Corrosion Technology, Inc., Wrightsville Beach, N.C.
CREVICE CORROSION AND METAL-ION CONCENTRATION CELL-CORROSION RESISTANCE OF CANDIDATE MATERIALS FOR OTEC HEAT EXCHANGERS, PARTS 1 AND 2
R. M. Kain May 1981 92 p refs Prepared for Argonne National Lab.
(Contract W-31-109-eng-38)
(DE82-000909; ANL/OTEC-BCM-022) Avail: NTIS HC A05/MF A01

Two separate studies are reported. In the first, titanium, stainless alloy AL-6X, Alclad 3003, aluminum alloy 5052, C70600, C72200 and Cu-10Ni-8Sn sheet materials were exposed to ambient temperature, low velocity seawater for 6 months and crevice corrosion and metal-ion concentration cell corrosion evaluations were conducted. Conditions were sufficiently critical to initiate crevice crack attack on control samples of Type 316 stainless steel. While no evidence of corrosion was detected for titanium and AL-6X, the five aluminum and copper base alloys all exhibited varying degrees of general and/or localized attack. In the second study, laboratory tests in low velocity, filtered seawater at 300 C resulted in initiation of crevice attack for 12 of the 13 stainless alloys included in the evaluation. For the most part, evidence of crevice corrosion initiation was detected within the first 30 days of exposure, although considerable variation in the observed time to initiation of crevice corrosion was noted. DOE

N82-16228# Virginia Polytechnic Inst. and State Univ., Blacksburg.
DEVELOPMENT AND APPLICATION OF ANALYTICAL TECHNIQUES TO CHEMISTRY OF DONOR SOLVENT LIQUEFACTION Quarterly Progress Report, Jul. - Sep. 1981
H. C. Dorn and L. T. Taylor Oct. 1981 29 p refs
(Contract DE-AC02-89PC-30041)
(DE82-001076; DOE/PC-30041/T7) Avail: NTIS HC A03/MF A01

The quantitation and speciation of organically bound trace metals in coal liquefaction soluble products presents a real challenge. Quantitation methods have been minimal and have involved single element analysis via atomic absorption spectrometry (AAS) or multi-element analysis via inductively coupled plasma atomic emission spectrometry (ICP-AES) both on acid digested aqueous-based matrices. These methods have not proven highly satisfactory because acid digestion introduces, in some cases, a substantial blank value, requires a great amount of time and in the AAS case provides for only single element determinations with mandatory background correction. Elimination of the sample step preparation coupled with use of ICP-AES seems highly attractive for trace multielement quantitative analysis of coal liquefaction products. We have recently established the capability for metal detection in an organic matrix. DOE

N82-16229# Southwest Research Inst., San Antonio, Tex.
RESIDUAL STRESS MEASUREMENTS IN STRUCTURAL STEELS Final Report, Aug. 1976 - Nov. 1979
R. R. King and V. D. Smith Apr. 1981 100 p refs
(Contract DOT-FH-11-9133)
(PB81-241499; SWRI-15-4660; FHWA/RD-81/086) Avail: NTIS HC A05/MF A01 CSCL 11F

A nondestructive system for in-situ measurement of residual stresses in steel highway structures was developed. Based on a literature survey, 26 candidate methods were evaluated. The Barkhausen noise analysis method was selected for indicating surface stresses and the ultrasonic shear wave birefringence method was selected for indicating bulk stresses in structural steels. GRA

N82-16230# Castle Technology Corp., Woburn, Mass.
ELECTROREFINING OF ALUMINUM
J. Paul Pemsler and Michael Dempsey 1 Apr. 1981 25 p refs
(Grant NSF DAR-80-09300)
(PB81-243693; NSF/CPE-81012) Avail: NTIS HC A02/MF A01 CSCL 11F

An inexpensive, energy-efficient approach to the electrorefining of contaminated aluminum scrap to a product suitable for recycle to wrought alloys was investigated. The method uses a low temperature aluminum chloride, sodium chloride electrolyte with stable organic additives to promote a dense, adherent solid aluminum electrodeposit. The organic leveling agent also permits electrodeposition at current densities two or three times greater than without the additive. Aluminum alloy samples containing magnesium, silicon, copper, chromium, and iron were electrorefined in the low temperature molten salt with additive to produce aluminum of high purity. Author

N82-16231# Inco Research and Development Center, Suffern, N. Y.
CHROMIUM SUBSTITUTION IN STAINLESS STEELS Final Report
S. Floreen Nov. 1980 80 p refs
(Contract DI-BM-NO-295070)
(PB81-235475; BM-OFR-110-81) Avail: NTIS HC A05/MF A01 CSCL 11F

A series of vacuum melted austenitic stainless steels were investigated that contained zero to 18 percent Cr and additions of Mo, V, Cu, Si, Al, Mn, or N. The corrosion resistance was evaluated in a number of environments. The results indicate that it is feasible to develop a stainless steel containing approximately 9 percent Cr along with additions of Mo and possibly Cu and V that would have corrosion resistance comparable to 18 percent Cr steels in less severe environments. The mechanical properties, fabricability, and weldability of such an alloy would be acceptable. GRA

N82-16232# Hazen Research, Inc., Golden, Colo.
INVESTIGATION OF BY-PRODUCT MOLYBDENUM RECOVERY
N. J. Preimesberger and D. R. Shaw Jun. 1981 187 p refs
(Grant NSF DAR-80-10576)
(PB81-246514; NSF/CPE-81014) Avail: NTIS HC A09/MF A01 CSCL 11F

A critical technical evaluation of some of the more prominent aspects of the recovery of by-product molybdenum by the froth flotation process is presented and some of the inadequacies and limitations which govern molybdenum recoveries are identified. Based upon these findings, general methods resulting in improvement in molybdenum recoveries are defined. Excluding the possibility of increased particle liberation, the changes to the various systems involve relatively basic modifications to the fundamental pulp chemistry in the flotation of copper and molybdenum bearing ores. GRA

N82-16233# American Gas Association Labs., Cleveland, Ohio.
CORROSIVE EFFECTS OF CONDENSATE
D. W. DeWerth and A. M. Waters Apr. 1981 47 p Sponsored by Gas Research Inst.
(PB81-244782; GRI-80/0069) Avail: NTIS HC A03/MF A01 CSCL 11F

A program was initiated to determine a suitable heat exchanger material to provide corrosion resistance for high efficiency gas fired condensing appliances. A special rig was designed and built. The analysis of the chemical compositions of flue gas condensate samples was completed for the six different fuel gases and pulse combustion furnace field study. Suitable methods were developed to measure for sulfate, sulfite, nitrate, nitrite, copper, nickel and iron and other metals. GRA

N82-16234# Ceramatec, Inc., Salt Lake City, Utah.
ELECTROREFINING OF SODIUM USING SOLID STATE RAPID ION CONDUCTORS Final Phase 1 Report, 1 Sep. 1980 - 28 Feb. 1981
Ronald S. Gordon Feb. 1981 33 p refs
(Grant NSF DAR-80-09646)
(PB81-243867; CER-30-81-001; NSF/CPE-81013) Avail: NTIS HC A03/MF A01 CSCL 11F

The presently available technology and selling costs for low cost sodium metal were investigated. An approach to the recovery of sodium containing salts as well as the refining of technical

grade sodium was developed and an experimental program was then designed to determine the ability of a particular solid state rapid ion conductor to selectively conduct sodium ions in a sodium purification cell. GRA

N82-16235# National Bureau of Standards, Washington, D.C. Corrosion and Electrodeposition Group.
PLATING ON ALUMINUM Final Report
David S. Lashmore Nov. 1980 66 p refs Sponsored in part by American Electroplater Society and Aluminum Association (PB81-239501; NBSIR-80-2142) Avail: NTIS HC A04/MF A01 CSCL 11F

The program includes both anodizing and immersion pretreatments as well as a discussion of adhesion. In addition to the summary of results, some details of the last seven months of the project are presented including the morphology of the initial stages of anodic film formation, the morphology of the interface of nickel coated anodized aluminum, and a discussion of adhesion. Author

N82-16236# Battelle Pacific Northwest Labs., Richland, Wash.
METAL PRODUCTION BY ELECTROLYSIS OF MOLTEN SALT-METAL SULFIDE SLURRIES
H. T. Fullam and J. N. Hartley Feb. 1981 69 p refs (Grant NSF DAR-79-10072)
(PB81-235434; NSF/CPE-81004) Avail: NTIS HC A04/MF A01 CSCL 11F

A slurry electrolysis process for producing zinc and sulfur from sphalerite concentrate, and lead and sulfur from galena concentrate is investigated. The process involves the electrolysis of a molten metal chloride slurry containing metal sulfide particulates to produce molten metal at the cathode and sulfur at the anode. GRA

N82-16237# General Accounting Office, Washington, D. C. Procurement, Logistics and Readiness Div.
CIVIL AGENCIES SHOULD SAVE MILLIONS BY RECOVERING SILVER FROM PHOTOGRAPHIC WASTES
31 Jul. 1981 84 p refs
(PB81-243479; PLRD-81-48) Avail: NTIS HC A05/MF A01 CSCL 11F

The recovery of silver in government photo laboratories is recommended. Internal audits to enforce compliance with recommended GSA regulations are advocated. Dollar savings of the recommended program are outlined. GRA

N82-17054*# Missouri Univ. -Rolla. Dept. of Metallurgical Engineering.
THE DETERMINATION OF THE STACKING FAULT ENERGY IN COPPER-NICKEL ALLOYS
H. P. Leighly, Jr. *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

N82-17067*# Tennessee Univ. Space Inst., Tullahoma. Dept. of Engineering Science and Mechanics.
SOLIDIFICATION OF A BINARY MIXTURE
Basil N. Antar *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 15 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

N82-17071*# Alabama Univ. in Huntsville. Dept. of Physics.
ALUMINUM AND CHROMIUM ION PARTICLE STUDIES FOR ENHANCEMENT OF SURFACE PROPERTIES
In its the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 12 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

N82-17078*# Clemson Univ., S.C. Materials Engineering Program.
ON RELATIONSHIP BETWEEN MICROFISSURING AND MICROSTRUCTURE IN THE HAZ OF INCONEL 718
Raymond G. Thompson *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 24 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-16238* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEAT SEALABLE, FLAME AND ABRASION RESISTANT COATED FABRIC Patent
Richard P. Tschirch (Little (Arthur D.), Inc., Cambridge, Mass.) and Kenneth R. Sidman, inventors (to NASA) (Little (Arthur D.), Inc., Cambridge, Mass.) Issued 18 Aug. 1981 5 p Filed 30 Apr. 1980 Supersedes N80-24440 (18 - 15, p 1959) Sponsored by NASA
(NASA-Case-MSC-18382-1; US-Patent-4,284,682; US-Patent-Appl-SN-145107; US-Patent-Class-428-263; US-Patent-Class-106-18.16; US-Patent-Class-106-18.24; US-Patent-Class-260-45.7R; US-Patent-Class-427-393.3; US-Patent-Class-428-264; US-Patent-Class-428-265; US-Patent-Class-428-267; US-Patent-Class-428-272) Avail: US Patent and Trademark Office CSCL 07C

Flame retardant, abrasion resistant elastomeric compositions are comprised of thermoplastic polyurethane polymer and flame retarding amounts of a filler selected from decabromodiphenyloxide and antimony oxide in a 3:1 weight ratio, and decabromodiphenyloxide, antimony oxide, and ammonium polyphosphate in a 3:1:3 weight ratio respectively. Coated fabrics employing such elastomeric compositions as coating film are flexible, lightweight, and air impermeable and can be made using heat or dielectric sealing procedures.
Official Gazette of the U.S. Patent and Trademark Office

N82-16239*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL CHARACTERISTICS OF A COMPOSITE TOTAL-SURFACE HIP REPLACEMENT Final Report
William R. Jones, Jr., Jack C. Roberts (Rensselaer Polytechnic Inst.), and Frederick F. Ling (Rensselaer Polytechnic Inst.) Washington NASA Jan. 1982 17 p refs Presented at the ASME-ASLE Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981
(NASA-TP-1853; E-709) Avail: NTIS HC A02/MF A01 CSCL 11H

Continuous fiber, woven E glass composite femoral shells having the same elastic properties as bone were fabricated. The shells were then encrusted with filled epoxy wear resistant coatings and run dry against ultrahigh molecular weight polyethylene acetabular cups in 42,000 and 250,000 cycle wear tests on a total hip simulator. The tribological characteristics of these continuous fiber particulate composite femoral shells articulating with ultrahigh molecular weight polyethylene acetabular cups were comparable to those of a vitallium ball articulating with an ultrahigh molecular weight polyethylene acetabular cup. Author

N82-16240# Forest Products Lab., Madison, Wis.
BEHAVIOR OF CONSTRUCTION ADHESIVES UNDER LONG-TERM LOAD
Bryan H. River and Robert H. Gillespie Jun. 1981 17 p refs (AD-A106565; FSRP-FPL-400) Avail: NTIS HC A02/MF A01 CSCL 11/1

Six construction adhesives and a conventional polyvinyl acetate adhesive were placed under dead load at five stress levels and three temperatures for 2 months. The shear slip was measured after 10, 100, 1,000, 10,000, and 100,000 minutes (70 days) under load. The results show four general types of behavior. Three construction adhesives with crosslinking capability had fair resistance to creep and showed evidence that a creep limit might be reached under moderate dead load and environmental conditions. Two adhesives had very poor creep resistance and failed under moderate dead load and environmental conditions. The sixth adhesive was extremely flexible but with excellent recovery capability. A polyvinyl acetate adhesive was

not observed to creep under the low humidity conditions of this study. Adhesives showing evidence of a creep limit may be useful for long-term design loads, but further study of their behavior, especially under varying moisture conditions, is required. Author (GRA)

N82-16241# Martin Marietta Corp., Baltimore, Md.
MECHANICAL PROPERTIES OF ADHESIVELY BONDED ALUMINUM STRUCTURES PROTECTED WITH HYDRATED INHIBITORS Progress Report, 1 Jul. 1980 - 30 Jun. 1981
J. S. Ahearn, G. D. Davis, A. Desai, and J. D. Venables 1 Oct. 1981 39 p refs
(Contract N00014-80-C-0718)
(AD-A106222; MML-TR-81-46C) Avail: NTIS HC A03/MF A01 CSCL 11/1

Research has shown that the adsorbed monolayer inhibitor films that slow the conversion of Al-oxide to hydroxide substantially improve the bond durability of 2024Al adherends prepared with the Forest Products Laboratory process (FPL). An inhibitor coating of nitrilotris (methylene) phosphonic acid produced a bond durability in adherends prepared with the FPL process. As determined by X-ray photoelectron spectroscopy, the inhibitor coverage needed to produce the maximum improvement in bond durability was approximately one monolayer. Results suggest that a compound's effectiveness in improving bond durability of adherends prepared with the FPL process depends on both its ability to inhibit the conversion of Al-oxide to hydroxide and to form chemical bonds with the adhesive. M.D.K.

N82-16242# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A FINITE ELEMENT MODEL OF A WHITE-METZNER VISCOELASTIC POLYMER EXTRUDATE M.S. Thesis - MIT
Brent R. Collins Feb. 1981 135 p refs
(AD-A106740; AFIT-CI-81-31T) Avail: NTIS HC A07/MF A01 CSCL 20/11

A finite element model of a viscoelastic polymer melt characterized by a White-Metzner rheological equation of state was developed. For creeping flow wherein the inertia terms are negligible non-linear finite element equations were solved by a method of direct substitution termed Picard iteration. Four flow geometries were examined: cross channel, plane couette, entry, and step flow. A comparison of two bi-quadradic isoparametric element types (8 node 'serendipity' and 9 node 'Lagrange') showed general superior behavior of the Lagrange elements. The 'penalty' method of incompressible flow was used with the Galerkin method to formulate the finite element equation, yielding satisfactory behavior for creeping inelastic and viscoelastic flow. The non-linear equations yielded numerical convergence up to Weissenberg numbers of 0.01. Techniques of expanding this radius of convergence were examined and proposed for future effort. Author (GRA)

N82-16243# Stanford Univ., Calif. Lab. of Physics.
PIEZOELECTRIC PVF2 POLYMER FILMS AND DEVICES Final Report, 1 Aug. 1977 - 31 Jan. 1981
D. G. Weinstein and H. J. Shaw Nov. 1981 130 p refs
(Contract N00014-77-C-0582; NR Proj. 384-925)
(AD-A107642; GL-3355) Avail: NTIS HC A07/MF A01 CSCL 20/3

Acoustic transducers and imaging arrays using PVF2 piezoelectric film as the active element have been extensively explored. Thin disk PVF2 bulk wave transducers were experimentally developed and studied using a computer model. Aspects of transducer behavior studied include bandwidth, impulse response, insertion loss, internal loss, impedance matching, and angular response. A monolithic multielement PVF2 transducer array is described which uses photolithographic techniques to achieve a reproducible, inexpensive and highly accurate integrated device for ultrasonic imaging applications. This array was used to produce an electronically focused and scanned acoustic beam. Two dimensional acoustic images of small test objects were performed, to investigate the beam shape and imaging characteristics, which were found to be consistent with theoretical predictions. At a frequency of 2.25 MHz and an f/number of 5, a resolution in the range of 3 mm was observed. Author (GRA)

N82-16244# Tennessee Univ., Knoxville.
PROCESS FOR THE FORMATION OF BIAXIALLY ORIENTED FILMS OF POLY(P-PHENYLENE TEREPHTHALAMIDE) (PPD-T) FROM LIQUID CRYSTALLINE SOLUTIONS Technical Report, 1 Jan. 1980 - 15 Sep. 1981
John E. Flood, James L. White, and John F. Fellers 12 Nov. 1981 44 p refs
(Contract N00014-77-C-0236)
(AD-A108058; PATRA-176; TR-6) Avail: NTIS HC A03/MF A01 CSCL 11/9

A new process for making equal biaxially oriented films from liquid crystalline solutions of poly (p-phenylene terephthalamide) (PPD-T) is described. The process involves extruding solutions of PPD-T/H2SO4 through an annular die and over an oil coated mandrel into a coagulation bath. The films were studied using wide angle X-ray diffraction (WAXS) and scanning electron microscopy (SEM). Tensile stress-strain properties were obtained on samples cut at various directions in the plane of the film. Biaxially oriented films were produced which possess equal properties in the various directions in the plane of the film. GRA

N82-16245# Utah Univ., Salt Lake City. Dept. of Chemistry.
STUDIES OF THE EFFECT OF ORIENTATION ON THE ELASTIC CONSTANTS OF STRETCHED AND HYDROSTATICALLY EXTRUDED POLY(CHLOROTRIFLOUROETHYLENE): A MODEL OF AFFINE ORIENTATION IN SEMI-CRYSTALLINE POLYMERS
D. B. Cavanaugh and C. H. Wang 13 Nov. 1981 35 p refs
(Contract N00014-79-C-0507)
(AD-A107909; TR-7) Avail: NTIS HC A03/MF A01 CSCL 11/9

A model of affine orientation of polymer solids is given. The solid is described as a collection of small, orientable units. The elastic constants of the oriented polymer are given as a combination of the elastic constants of the orientable units and of the orientation parameters (P sub 2(cos Theta)) and (P sub 4 (cos Theta)). The elastic constants of stretched and hydrostatically extruded samples of poly (chlorotriflouroethylene) are obtained with Brillouin light scattering. These are fitted to the model and the orientation parameters are calculated. The elastic constants from the extruded samples are fit well by the model but the fit to the stretched film is less satisfactory by the model. Hydrostatic extrusion in polymers is thus assumed to be an affine orientation process in the amorphous phase and the stretching process is non-affine. Author (GRA)

N82-16246# Utah Univ., Salt Lake City. Dept. of Chemistry.
ASSIGNMENT OF AN ANOMALOUS PEAK IN THE BRILLOUIN SPECTRUM OF ORIENTED POLYMER FILMS
D. B. Cavanaugh and C. H. Wang 13 Nov. 1981 18 p refs
(Contract N00014-79-C-0507)
(AD-A107897; TR-8) Avail: NTIS HC A02/MF A01 CSCL 11/9

The origin of a previously unassigned peak in the Brillouin spectrum of an oriented polymer film has been clarified. This peak is shown to be due to backscattering from a quasitransverse acoustic phonon from the reflected laser beam. Studies of this peak are expected to provide the information concerning the birefringence effect of the oriented film. GRA

N82-16247# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymers Branch.
SYNTHESIS OF ARTICULATED ALL-PARA POLYMERS Final Report, Nov. 1977 - Dec. 1979
R. C. Evers, F. E. Arnold, and T. E. Helminiak Oct. 1981 35 p refs
(AF Proj. 2303)
(AD-A107554; AFWAL-TR-81-4098) Avail: NTIS HC A03/MF A01 CSCL 11/9

Articulated all-para-polymers with 2,6-benzobisoxazole, 2,6-benzobisthiazole, and 2,6-benzobisimidazole units in the backbone were synthesized by copolycondensation in polyphosphoric acid of 4,6-diamino-1,3-benzenediol dihydrochloride, 2,5-diamino-1,4-benzenedithiol dihydrochloride, and 1,2,4,5-tetraaminobenzene tetrahydrochloride, respectively, with terephthalic acid and reactive diphenoxybenzene monomers. Inherent viscosities of up to 12.57 dL/g (CH3SO3H, 25 C, 0.2g/dl) were achieved. The average length of the rod-like all-para

segments between the relatively flexible diphenoxybenzene units was controlled by the stoichiometry of the copolycondensation reactions. Films which exhibited optical birefringence under crossed polars could be cast from methanesulfonic acid solutions of the polymers. Modulus and tensile strength values as high as 4696 mPa and 93 mPa, respectively, were recorded. Thermooxidative stability of the articulated polymers was evaluated by isothermal aging in air at 316 C. Stability for the articulated polybenzobisoxazoles was found to decrease with increased content of the diphenoxybenzene structure. The articulated polybenzobisoxazole structure was shown to be less stable than the anlogous polybenzobisthiazole structure but more stable than the articulated polybenzobisimidazole structure. GRA

N82-16248# Sandia Labs., Albuquerque, N. Mex.
AQUEOUS DISSOLUTION OF CALCIUM METAPHOSPHATE GLASSES
Bruce C. Bunker 1981 9 p refs Presented at the JOWOG-12 Conf., Aldermaston, UK, 21 Sep. 1981
(Contract DE-AC04-76DP-00656)
(DE81-030130; CONF-810953-2) Avail: NTIS HC A02/MF A01

A series of experiments was conducted to determine the kinetics and mechanisms of aqueous dissolution for a series of phosphate glasses having the mole % composition (50X) M2 O.XCaO.5OP2O5, where M is either Na or Li. Results of experimentation are discussed. M.D.K.

N82-16249# Los Alamos Scientific Lab., N. Mex.
PREPARATION OF MULTISHELL ICF TARGET PLASTIC-FOAM CUSHION MATERIALS BY THERMALLY INDUCED PHASE-INVERSION PROCESSES
A. T. Young, D. K. Moreno, and R. G. Marsters 1981 18 p refs Presented at the 28th Natl. Vacuum Symp., Anaheim, Calif., 3-6 Nov. 1981
(Contract W-7405-eng-36)
(DE82-000574; LA-UR-81-2722; CONF-811113-10) Avail: NTIS HC A02/MF A01

Homogenous, low-density plastic foams for laser fusion targets were prepared by thermally induced phase inversion processes. Uniform, open cell foams were obtained by the rapid freezing of water solutions of modified cellulose polymers with densities in the range of 5 mg/cu cm to 0.7 mg/cu cm and respective average cell sizes of 2 to 40 micrometers. In addition, low-density, microcellular foams were prepared from the hydrocarbon polymer poly(4-methyl-l-pentene) via a similar phase inversion process using homogenous solutions in organic solvents. These foams have densities from 2 to 5 mg/cu cm and average cell sizes of 20 micrometers. The physical-chemical aspects of the thermally induced phase inversion process are presented. DOE

N82-16250# Pacific Northwest Lab., Richland, Wash.
MATERIALS AND DESIGN EXPERIENCE IN A SLURRY-FED ELECTRIC GLASS MELTER
S. M. Barnes and D. E. Larson Aug. 1981 194 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000957; PNL-3959) Avail: NTIS HC A09/MF A01

The design of a slurry-fed electric glass melter and an examination of the construction materials were completed. The joule-heated, ceramic-lined melter was constructed to test the applicability of materials and processes for high-level waste vitrification. The developmental liquid-fed ceramic melter was operated for three years with simulated high-level waste and was subjected to conditions more severe than those expected for a nuclear waste vitrification plant. DOE

N82-16251# California Univ., Livermore. Lawrence Livermore Lab.
METAL-CONTAINING PLASMA-POLYMERIZED COATINGS FOR LASER-FUSION TARGETS
S. A. Letts and C. W. Jordan 14 Sep. 1981 9 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981
(Contract W-7405-eng-48)
(DE82-000346; UCRL-86184; CONF-811113-9) Avail: NTIS HC A02/MF A01

Addition of metal to plastic layers in some direct drive laser fusion targets is needed to reduce electron induced fuel preheat. A plasma polymerization coating system was constructed to produce a metal seeded polymer by adding an organometallic gas to the usual trans-2-butene and hydrogen feedstocks. Since organometallic gases are highly reactive and toxic, safety is a major concern in the design of a coating system. The coating apparatus was designed with three levels of containment to assure protection of the operator. The gas handling system has redundant valves and was designed to fail safe. Several sensor controlled interlocks assure safe operating conditions. Waste materials are collected on a specially designed cold trap. Waste disposal is accomplished by heating the traps and purging volatile products through a reactor vessel. The design, operating procedure, and safety interlocks of this coating system are described. DOE

N82-16252# Sandia Labs., Albuquerque, N. Mex.
INTERFEROMETRIC STUDY OF EPOXY RESIN GELATION
K. R. Hirschbuehler 1981 28 p refs Presented at Office of Naval Res. Critical Rev.: Techniques for the Characterization of Composite Mater., Cambridge, Mass., 8 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030128; CONF-8106158-1) Avail: NTIS HC A03/MF A01

The transition of epoxy resins from a mobile liquid to a rubbery gel is a complex process depending on chemical reaction kinetics and both heat and mass transfer. The purpose of this study is to determine the locus of initial gelation in an epoxy resin, and the course of gelation through both neat resins and glass fiber/epoxy resin composites. This was accomplished by monitoring the local changes in refractive index in transparent epoxy castings using laser interferometry, supplemented by temperature profiles obtained from thermocouple arrays. These experiments were carried out on pure DGEBA epoxy (DOW DER-332) cured with a variety of primary amine, secondary amine, and anhydride curing agents. DOE

N82-16253# Council for Scientific and Industrial Research, Pretoria (South Africa). National Timber Research Inst.
SUBSTITUTES FOR PARAFORMALDEHYDE HARDENER AND ZINC ACETATE AS AN ACCELERATOR IN WATTLE-TANNIN BASED ADHESIVES FOR EXTERIOR GRADE PARTICLE BOARD
F. A. Cameron and A. Pizzi Sep. 1980 36 p refs
(PB81-245755; CSIR/SR/HOUT-201; ISBN-0-7988-2018-7)
Avail: NTIS HC A03/MF A01 CSCL 11A

A series of experiments carried out to find a suitable substitute for paraformaldehyde as a hardener in modified wattle-tannin based adhesive used in the manufacture of exterior grade particleboard are described. The use of zinc acetate in modified wattle-tannin based adhesives for exterior grade particle-board in order to bring about curing of the adhesive at lower pressing temperatures with the subsequent possibility of reducing the percentage of resin solids on core chips is investigated. GRA

N82-16254# National Timber Research Inst., Pretoria (South Africa).
FAST-SETTING PHENOLIC AND TANNIN-BASED HONEY-MOON ADHESIVE SYSTEMS FOR EXTERIOR GRADE FINGER JOINTS
A. Pizzi, D. DuT. Rossouw, W. Knueffel, and M. Singmin Mar. 1980 38 p refs
(PB81-245748; CSIR/SR/HOUT-184; ISBN-0-7988-1784-4)
Avail: NTIS HC A03/MF A01 CSCL 11A

The development of alternative tannin-based fast setting adhesives is described. Adhesives not containing m-aminophenol and phenolic/phenolic, tannin/tannin and tannin/phenolic adhesive systems which can be used for the same purpose were developed. GRA

N82-16255# Maryland Univ., College Park. Photomechanics Lab.
CRACK BRANCHING IN BRITTLE MATERIALS. PART 1: ANALYTICAL ASPECTS
H. P. Rossmanith 1980 148 p refs
(Grant NSF DAR-77-05171)
(PB81-243735; NSF/RA-800560) Avail: NTIS HC A07/MF A01 CSCL 11B

Fracture processes associated with crack acceleration and

branching, conditions for branching, and the dependence of the branching angle on fracture test specimen geometry and loading conditions are discussed. Stress wave induced crack branching was investigated. A comparative study of explosively induced fracture and crack branching in glass, polymers, and rock is included. Some of the most frequently employed static and dynamic crack models are summarized and briefly discussed. Information on mathematical models for dynamic crack branching covers pre-branching analysis, elastic crack problem, elasto-plastic crack problem, secondary cracking ahead of the crack tip, the c-K-relationship, and the dynamic c-K-curve. GRA

N82-16256# Harvard Univ., Cambridge, Mass. Center for Conservation and Technical Studies.
SOME APPLICATIONS OF FOURIER TRANSFORM INFRARED SPECTROSCOPY IN THE EXAMINATION OF PAINTING MATERIALS
Richard Newman 1981 29 p refs
(Grant NEA-92-2033-386)
(PB81-249575) Avail: NTIS HC A03/MF A01 CSCL 11C

Although limited in its applications to painting materials, infrared spectroscopy nevertheless is very useful and even essential in helping to fully characterize certain of these materials. Fourier transform infrared spectroscopy offers several advantages over traditional dispersive infrared spectrophotometry, and generally gives spectra of higher quality than those obtainable with older instrumentation. Applications to resins and several traditional modern pigments are described, and the theoretical basis for spectral correlations in inorganic compounds containing polyatomic ions (which include many pigments) is briefly discussed. GRA

N82-17044*# Tennessee Technological Univ., Cookeville. Dept. of Chemistry.
DEVELOPMENT OF TOUGHENED EPOXY POLYMERS FOR HIGH PERFORMANCE COMPOSITE AND ABLATIVE APPLICATIONS
Vernon R. Allen *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 17 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

N82-17050*# Mississippi State Univ., State College. Dept. of Chemical Engineering.
DEVELOPMENT OF HIGH STRENGTH, HIGH TEMPERATURE CERAMICS
William B. Hall *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 11 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

N82-17055*# Alabama Univ. in Huntsville. Dept. of Chemistry.
SYNTHESIS OF AMINOSILANE AND AROMATIC DIAMINE INTERMEDIATES FOR POLYMERIZATION
Samuel P. McManus *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-16257# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Sect.
PROPELLANT SURVEILLANCE REPORT LGM-30 A, B, F AND G STAGE I TP-H1043 AFT CLOSURE PROPELLANT Semiannual Report
John A. Thompson Oct. 1981 70 p refs
(AD-A107877; MANPA-462(81)) Avail: NTIS HC A04/MF A01 CSCL 21/9

This report contains propellant test results from cartons of TP-H1043 propellant representing selected batches used in the aft closure of First Stage Minuteman Motors. Data from TP-H1043 propellant obtained from the aft closures of the LGM-30 A, B, F, and G Motors are reported in regression analyses for the sixth time and the fifth time using the G085 Computer System. In previous reports, A, B, F, and G data were combined for statistical analysis. For this report, a separate statistical analysis was made for A and B (wing 2) and F and G (wing 6). The statistical analysis includes regressions and covariance analysis. Testing was accomplished in accordance with MMWRBA Project M8293C. An analysis of all parameters indicate that no significant degradation is anticipated for at least two years past the oldest data point. Each point on the regression plot represents all samples at that particular age. The number of samples of each point is indicated on the sample size summary sheet on the page accompanying each regression plot. The data range at any age can be found by suitable inquiry of the G085 System.
Author (GRA)

N82-16258# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
SKID-TEST EVALUATION OF PROTECTIVE COVERINGS FOR EXPLOSIVE BILLETS
Jim A. Crutchmer Sep. 1981 8 p ref
(Contract DE-AC04-76DP-00487)
(DE82-000072; MHSMP-81-39; Process-Develop-Endeavor-301) Avail: NTIS HC A02/MF A01

A total of thirteen materials were evaluated for use as protective coverings for as-pressed explosive billets. A small sample of material was taped over the contact area of the skid billets during testing. Preliminary skid testing indicated several of these materials may be effective as protective coverings. Three of the materials were selected, based on their strength and ease of handling, for complete skid test evaluation using as-pressed PBX 9404. Nylon mesh, style 8664 was found to give the greatest protection against accidental detonation of the explosive. DOE

N82-16259# Bevilacqua (O. M.) and Associates, Oakland, Calif.
ENVIRONMENTAL ASSESSMENT OF THE USE OF ALCOHOL FUELS IN HIGHWAY VEHICLES
O. M. Bevilacqua, M. J. Bernard, III, D. Sperling, S. Rosenberg, L. J. Hill, D. Fingleton (WAPORA, Inc., Chicago), P. DEliscu (Santa Clara Univ.), and J. R. Gasper Dec. 1980 307 p refs Prepared jointly with Argonne National Lab.
(Contract W-7405-eng-38)
(DE82-000887; ANL/CNSV-14) Avail: NTIS HC A14/MF A01

Impact associated with alcohol fuel storage, distribution, and use are assessed under four possible scenarios of alcohol fuel use during the period 1980 to 2000. Alcohol use is projected to range from 196 million bbl/yr by 2000, up from 5 million barrels in 1980. In addition to effects on the physical environment (aquatic and terrestrial ecosystems, air quality, and energy resources), consideration is given to the impacts of alcohol fuel use on such social and economic concerns as health and safety, employment, retail fuel costs, balance of trade, capital investments, and regulatory needs. Although some potentially negative impacts are identified, in general, the assessment finds that the use of alcohol fuels would have a positive or neutral effect on the environment; moreover, the negative impacts could be mitigated through the judicious application of existing regulatory controls and procedural standards. DOE

N82-16260# Boeing Engineering and Construction, Seattle, Wash.
AGRI GRAIN POWER ETHANOL-FOR-FUEL PROJECT FEASIBILITY STUDY REPORT. VOLUME 1: PROJECT CONCEPTUAL DESIGN
Apr. 1981 86 p Sponsored in part by AGRI Industries, Grain Processing Corp. and Industries of Iowa 3 Vol.
(Contract DE-FG01-80RA-50331)
(DE82-000474; DOE/RA-50331/T1-Vol-1) Avail: NTIS HC A05/MF A01

The feasibility of the AGRI grain power (AGP) project to evaluate the commercial viability and assess the desirability of implementing a large grain based grass roots anhydrous ethanol

fuel project near Des Moines, Iowa is evaluated. The conceptual design is presented. DOE

N82-16261# Boeing Engineering and Construction, Seattle, Wash.
AGRI GRAIN POWER ETHANOL-FOR-FUEL PROJECT FEASIBILITY STUDY REPORT. VOLUME 2: PROJECT MARKETING/ECONOMIC/FINANCIAL AND ORGANIZATION
Apr. 1981 146 p Sponsored in part by AGRI Industries, Grain Processing Corp. and Industries of Iowa 3 Vol.
(Contract DE-FG07-80RA-50331)
(DE82-000472; DOE/RA-50331/T1-Vol-2) Avail: NTIS HC A07/MF A01

The feasibility of the AGRI grain power (AGP) project to evaluate the commercial viability and assess the desirability of implementing a large grain based grass-roots anhydrous ethanol fuel project near Des Moines, Iowa is evaluated. The results of marketing, economic, and financial studies are reported. DOE

N82-16262# Boeing Engineering and Construction, Seattle, Wash.
AGRI GRAIN POWER ETHANOL-FOR-FUEL PROJECT FEASIBILITY STUDY REPORT. VOLUME 3: PROJECT ENVIRONMENTAL/HEALTH/SAFETY AND SOCIOECONOMICS
Apr. 1981 128 p Sponsored in part by AGRI Industries, Grain Processing Corp. and Industries of Iowa 3 Vol.
(DE82-000473; DOE/RA-50331/T1-Vol-3) Avail: NTIS HC A07/MF A01

The feasibility of the AGRI grain power (AGP) project to evaluate the commercial viability and assess the desirability of implementing a large grain based grass-roots anhydrous ethanol fuel project near Des Moines, Iowa is evaluated. The results of the environmental, health, safety, and socioeconomic studies are presented. DOE

N82-16263# Oak Ridge National Lab., Tenn. Instrumentation and Controls Div.
POTENTIAL ECONOMIC BENEFITS FROM PROCESS CONTROL OF COAL PREPARATION PLANTS
N. C. Bradley, G. O. Allgood, and J. C. Moyers Oct. 1981 55 p refs
(Contract W-7405-eng-26)
(DE82-000881; ORNL-5736) Avail: NTIS HC A04/MF A01

In practically all US coal preparation plants, the machines and instrumentation and control devices are manually operated to clean the run-of-the-mine coal of mud, rock, and other contaminants that are removed from the earth with the desired product. The result is a large loss of a valuable natural resource. Based on 1978 production figures, 10 million tons of discarded coal could have been saved by on-line measurement and control techniques. Measurement sensors for on-line control of coal cleaning process should be developed because there are no commercial, moderate-cost sensors of medium accuracy (5 to 10 percent) available for such applications. An expenditure of approximately $10 million to develop measurement sensors and process control techniques for coal preparation would be recovered by the conservation of coal. DOE

N82-16264# Department of Agriculture and Fisheries, Silverton (South Africa). Div. of Agricultural Engineering.
SUNFLOWER SEED OIL AS AN EXTENDER FOR DIESEL FUEL IN AGRICULTURAL TRACTORS
J. J. Bruwer, B. vanD. Boshoff, F. J. C. Hugo, L. M. duPlessis, J. Fuls, C. Hawkins, A. N. vanderWalt, and A. Engelbrecht 1980 8 p refs Presented at the Symp. of the South African Inst. of Agr. Engr., Silverton, South Africa, 11 Jun. 1980
(DE81-903440; CONF-8006187-1) Avail: NTIS US Sales Only HC A02/MF A01; DOE Depository Libraries

The use of sunflower seeds as an extender for diesel fuels in agricultural tractors is considered. Production requirements to meet the demand are briefly reviewed. Physical and chemical properties of sunflower seed oil are discussed. Tractor engines using diesel fuel or sunflower seed oil were tested as well as engines using various blends of sunflower seed oil with gasoline, diesel fuel, power kerosene, and illuminating kerosene. Results were compared. Engine service life and injection equipment performance are discussed. DOE

N82-16265# Fulton Energy Corp., Tulsa, Okla.
ASSESSMENT OF THE ECONOMIC, TECHNICAL, AND ENVIRONMENTAL FEASIBILITY OF DEVELOPING, CONSTRUCTING, AND OPERATING A 25-MILLION-GALLON-PER-YEAR GRAIN-ETHANOL-PRODUCTION FACILITY. VOLUME 1: EXECUTIVE SUMMARY
May 1981 47 p 4 Vol.
(Contract DE-FG07-80RA-50365)
(DE82-000294; DOE/RA-50365/T1-Vol-1) Avail: NTIS HC A03/MF A01

The economic, technical, and environmental feasibility of developing, constructing, and operating a 25 million gallon per year ethanol facility in northeastern Oklahoma was determined. The executive summary is presented. A site providing the necessary grain, energy, and labor resources; flexible transportation methods and alternatives for receiving and shipping; nearby markets for products and by-products; an existing environmental quality able to withstand the minor impacts of the process; and a receptive and growing business and community environment was selected. The ability to produce a high quality product at a reasonable and competitive price with or without federal assistance or state assistance in the form of tax exemptions is demonstrated. It is shown that coal burning technologies are efficient, whether conventional burning methods or innovative methods such as fluidized-bed combustion are used. All resources for the process are available nearby. The grains required come from carryover reserves, thus not impacting the food supply. The residual by-products are in high demand. DOE

N82-16266# Fulton Energy Corp., Tulsa, Okla.
ASSESSMENT OF THE ECONOMIC, TECHNICAL, AND ENVIRONMENTAL FEASIBILITY OF DEVELOPING, CONSTRUCTING, AND OPERATING A 25-MILLION-GALLON-PER-YEAR GRAIN-ETHANOL-PRODUCTION FACILITY. VOLUME 2: TECHNICAL ANALYSIS
May 1981 178 p 4 Vol.
(Contract DE-FG07-80RA-50365)
(DE82-000479; DOE/RA-50365/T1-Vol-2) Avail: NTIS HC A09/MF A01

The technical analysis of a study to determine the economic technical, and environmental feasibility of developing, constructing, and operating a 25 million-gallon per year ethanol facility in northeastern Oklahoma is presented. It is shown that coal burning technologies are efficient, whether conventional burning methods or innovative methods such a fluidized-bed combustion are used. All resources for the process are available nearby. The grains required come from carryover reserves, thus not impacting the food supply. The residual by-products are in high demand. DOE

N82-16267# Fulton Energy Corp., Tulsa, Okla.
ASSESSMENT OF THE ECONOMIC, TECHNICAL, AND ENVIRONMENTAL FEASIBILITY OF DEVELOPING, CONSTRUCTING, AND OPERATING A 25-MILLION-GALLON-PER-YEAR GRAIN-ETHANOL-PRODUCTION FACILITY. VOLUME 3: PROCUREMENT ANALYSIS, MARKETING ANALYSIS, AND ENVIRONMENTAL AND REGULATORY ANALYSIS
May 1981 260 p 4 Vol.
(Contract DE-FG07-80RA-50365)
(DE82-000478; DOE/RA-50365/T1-Vol-3) Avail: NTIS HC A12/MF A01

The economic, technical, and environmental feasibility of developing, constructing and operating a 25 million-gallon per year ethanol facility in northeastern Oklahoma was investigated. The resource procurement analysis, the marketing analysis, and the environmental, health, safety, and socioeconomic analyses are presented. DOE

N82-16268# Fulton Energy Corp., Tulsa, Okla.
ASSESSMENT OF THE ECONOMIC, TECHNICAL, AND ENVIRONMENTAL FEASIBILITY OF DEVELOPING, CONSTRUCTING, AND OPERATING A 25-MILLION-GALLON-PER-YEAR GRAIN-ETHANOL-PRODUCTION FACILITY. VOLUME 4: ECONOMIC AND FINANCIAL ANALYSIS,

MANAGEMENT ANALYSIS
May 1981 286 p refs 4 Vol.
(Contract DE-FG07-80RA-50365)
(DE82-000477; DOE/RA-50365/T1-Vol-4) Avail: NTIS HC A13/MF A01

The economic, technical, and environmental feasibility of developing, constructing and operating a 25 million-gallon per year ethanol facility in northeastern Oklahoma was investigated. The economic and financial analysis portion of the investigation is presented. DOE

N82-16269# California Univ., Livermore. Lawrence Livermore Lab.
LLNL GAS-STIMULATION PROGRAM Semiannual Progress Report, Oct. 1980 - Mar. 1981
M. E. Hanson, G. D. Anderson, and R. J. Shaffer 9 Jun. 1981 52 p refs
(Contract W-7405-eng-48)
(DE82-000802; UCRL-50036-81-1) Avail: NTIS HC A04/MF A01

Preliminary theoretical and experimental analyses of fracture propagation in a nonuniform stress field were performed. Preliminary analyses of fluid flow in apertures were completed. The mechanical properties of some of the core material from Mesaverde sandstones and shales from wells in Wyoming and Colorado were characterized. The feasibility of ultrasonic techniques in measuring in-situ stresses was investigated. Development of a transducer package to test the measurements in a borehole, and techniques to evaluate and interpret measurements are described. The effect of stress on velocity anisotropy was investigated. Geologic studies relating in-situ stresses to geologic structure and examining the effects of pore pressure increases on fracturing in the Green River Basin due to gas generation were performed. DOE

N82-16270# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
SYSTEMS ANALYSIS OF H2/NATURAL GAS SUPPLEMENTATION AND SEPARATION
M. Beller and J. DAcierno 1981 5 p refs Presented at Ann. Contractors' Rev. Meeting on Thermal and Chem. Storage, Tysons Corner, Va.
(Contract DE-AC02-76CH-00016)
(DE81-030031; BNL-29962; CONF-810940-3) Avail: NTIS HC A02/MF A01

A systems analysis of the concept of supplementing natural gas with hydrogen was conducted in terms of present fuel supplies and prices. An added option was analyzed; this involves separation of the hydrogen from the mixed stream for use as a nonenergy commodity. The study concludes that no insurmountable barriers exist for the supplementation concept; the separation option will depend only upon economic factors. DOE

N82-16271# Stearns-Roger Corp., Denver, Colo.
BI-GAS PILOT PLANT OPERATION Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1980
1980 139 p
(Contract DE-AC01-80ET-14705)
(DE82-000223; DOE/ET-14705/22) Avail: NTIS HC A07/MF A01

At present, the major development effort is concentrated on gasification. As is typical for developmental projects of this magnitude, a large number of operating difficulties have been experienced and overcome since the first operations in August of 1976. Currently the overcoming of operating difficulties still requires some effort. However, most tests are stable and allow the gathering of process design data in the form of validated heat and material balances. These are applied in model simulations of gasifier operation. DOE

N82-16272# Radian Corp., McLean, Va.
VERIFICATION OF THE FOREIGN SYNFUELS INDUSTRIALIZATION EXPERIENCE Final Report
Sep. 1981 88 p refs Prepared jointly with Institute of Gas Technology, Chicago and Research Planning Associates, Paris
(Contract DE-AC01-80RA-50006)
(DE82-000230; DOE/RA-50006/T1; DCN-81-207-001-08) Avail: NTIS HC A05/MF A01

A survey of foreign commercial gasifiers is presented. A master list of commercial gasifiers operating in foreign countries was prepared, listing facilities which are currently operating or have been shut down for less than five years. This list represents the set of sources from which gasifier operation information is potentially available. On site visits to two facilities are reported. DOE

N82-16273# Instituto de Pesquisas Tecnologicas, Sao Paulo (Brazil).
PROCEEDINGS OF THE 4TH INTERNATIONAL SYMPOSIUM ON ALCOHOL FUELS TECHNOLOGY, VOLUME 1
1980 483 p refs In PORTUGUESE and ENGLISH Symp. held at Sao Paulo, Brazil, 5-8 Oct. 1980 2 Vol.
(DE81-903753; CONF-801030-Vol-1) Avail: NTIS (US Sales Only) HC A21/MF AC1; DOE Depository Libraries

Progress in alcohol and biomass fuels research is reported. Three main areas regarding the alcohol and biomass fuels are covered: production and distribution, utilization, and socio-economical impacts. DOE

N82-16274# Instituto de Pesquisas Tecnologicas, Sao Paulo (Brazil).
PROCEEDINGS OF THE 4TH INTERNATIONAL SYMPOSIUM ON ALCOHOL FUELS TECHNOLOGY, VOLUME 2
1980 433 p refs In PORTUGUESE and ENGLISH Symp. held at Sao Paulo, Brazil, 5-8 Oct. 1980 2 Vol.
(DE81-903754; CONF-801030-Vol-2) Avail: NTIS (US Sales Only) HC A19/MF A01; DOE Depository Libraries

An overview of alcohol fuels technology is given. Topics covered include: diesel engines, fleet tests, lubrication and emission, socioeconomic aspects, and project summaries. DOE

N82-16275# Los Alamos Scientific Lab., N. Mex.
CATALYTIC COAL CONVERSION SUPPORT: USE OF LASER FLASH-PYROLYSIS FOR STRUCTURAL ANALYSIS Progress Report, 1 Oct. - 31 Dec. 1980
C. K. Rofer-Depoorter, comp. Oct. 1981 5 p
(Contract W-7405-eng-36)
(DE82-004221; LA-9033-PR) Avail: NTIS HC A02/MF A01

A coal processing apparatus that will allow online sampling of gases generated during coal processing is operational. Improvements were made in the lasers and the GC/MS. Lignin impregnated with ZnCl2, coal extracted with liquid CO2, and isolated resinite and fusinite were pyrolyzed. A thermal model of the pyrolysis is being developed. DOE

N82-16276# McElroy (Ralph) Co., Austin, Tex.
IMPROVEMENTS IN EXPLOSIVE CHARGES
1981 12 p Transl. into ENGLISH of French Patent no. 971,324 (16 Jan. 1951) Prepared for Los Alamos Scientific Lab.
(Contract W-7405-eng-36)
(DE81-028977; LA-tr-81-23) Avail: NTIS HC A02/MF A01

The perfection of explosive charges made up chiefly of uranium and thorium is liable to cause, because of neutron activity, a chain reaction. Improvements are described that consist of determining the mass or critical conditions, of assembling the explosive charge so that at the desired time the critical conditions are attained or surpassed and, at the instant of the explosive charge's use, to achieve those conditions equal or superior to the critical conditions, whether gradually or all at once, and in any case, preferably at extreme speed at the end of the process. DOE

N82-16277# Sandia Labs., Albuquerque, N. Mex.
REVERSIBILITY OF COAL LIQUEFACTION
M. G. Thomas, T. C. Bickel, and D. E. Trudell 1981 16 p refs Presented at the Ann. Meeting of the Inst. of Chem. Engr., New Orleans, 8 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE81-027804; SAND-81-0211C; CONF-811108-3) Avail: NTIS HC A02/MF A01

Dissolution of coal was shown to be affected by the amount of preasphaltenes formed which is related to the repolymerization of preasphaltenes when solvent quantity and/or quality are limited. Repolymerized preasphaltenes are shown to be reactive suggesting that a process reversibility exists for this first step of the liquefaction sequence and explaining limited solvation for early

stage liquefaction. This reversibility is direct evidence that gas formation is a non-essential side reaction that is a consequence of time at temperature, not the interconversion of coal derived materials. Addition of asphaltenes, increases the amount of oil produced. This increase is accompanied by some polymerization of the asphaltenes. Process reversibility is thus observed for both the primary and secondary step of liquefaction. The effect of increases in hydrogen availability by chemical spikes and/or H-donor molecules was shown to partially compensate for the solvent deficiencies observed in the later stages of processing. M.D.K.

N82-16278# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

SMALL-SCALE FUEL-ALCOHOL PLANT. VOLUME 2: DETAILED EQUIPMENT INFORMATION Design Report

Aug. 1981 206 p

(Contract DE-AC07-76ID-01570)

(DE82-001037; DOE/TIC-2001037-Vol-2; ID-10102-Vol-2) Avail: NTIS HC A10/MF A01

Technical information about the equipment used in the Small Scale Fuel Alcohol Plant (SSFAP) is reported. Details are provided in the form of data sheets for off-the-shelf mechanical equipment and instrumentation. A specification is also included for a microprocessor. Complete drawings are included for mechanical hardware specifically designed for this plant. The information is arranged with all instrument and equipment data sheets grouped by the type of equipment. Vendor listings are provided for each type of equipment required. The design in this report represents the design after startup testing and some short periods of operation but before continuous production began. It is expected that a person or firm desiring to build a similar plant would hire a consultant or architect-engineering firm to modify this design to fit the specific application and site. DOE

N82-16279# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

SMALL-SCALE-FUEL-ALCOHOL PLANT. VOLUME 3: CONSTRUCTION INFORMATION Design Report

Aug. 1981 140 p

(Contract DE-AC07-76ID-01570)

(DE82-001036; DOE/TIC-2001036-Vol-3; ID-10102-Vol-3) Avail: NTIS HC A07/MF A01

General information about the construction of the Small-Scale Fuel Alcohol Plant (SSFAP) is reported. Suggested design changes are listed: it is recommended that anyone planning to build a plant similar to this one consider incorporating these changes. The construction information included here consists of photographs of the plant, a list of important mechanical construction details, electrical drawings showing the power distribution schematic, and end-to-end wiring schematics for the plant control. The photographs show the relative locations of major equipment and can be used in conjunction with the Piping and Instrumentation Diagrams (P and IDs) in Appendix F of Volume 1 to physically lay out the plant. The design in this volume represents the design after startup testing and some short periods of operation but before continuous production began. It is expected that a person or firm desiring to build a similar plant would hire a consultant or architect-engineering firm. DOE

N82-16280# Oak Ridge National Lab., Tenn.

CONTROL OF FRACTIONATION-AREA CORROSION AT SRC PILOT PLANTS

J. R. Keiser, R. R. Judkins, V. B. Baylor, D. R. Canfield, and W. P. Barnett Oct. 1981 33 p refs

(Contract W-7405-eng-26)

(DE82-001949; ORNL/TM-7937) Avail: NTIS HC A03/MF A01

Fractionating columns at the Fort Lewis, Washington, and Wilsonville, Alabama, solvent refined coal pilot plants have experienced severe corrosion. This corrosion is most serious for materials exposed in the 230 to 2500 C range. Corrosion rates as high as 25 mm/year (1000 mils/year) on carbon steel and 6.4 mm/year (250 mils/year) on type 18-8 stainless steels have been observed. This corrosion problem was studied through exposure of coupons in the columns, analysis of failed through components from pilot plants, chemical analysis of liquids from the pilot plants, and operation of laboratory experiments. The in plant exposure of coupons shows that certain nickel base alloys have adequate corrosion resistance for the environment. Chemical analyses of pilot plant liquids show that the presence of appreciable levels of water soluble chloride is a necessary but not sufficient condition for these oils to be corrosive. DOE

N82-16281# Gilbert (Glen A.) and Associates, Inc., Oak Ridge, Tenn.

FOREIGN COAL-LIQUEFACTION-TECHNOLOGY SURVEY AND ASSESSMENT

T. D. Pay and S. S. Patel Oct. 1981 341 p refs Prepared for ORNL

(Contract W-7405-eng-26)

(DE82-0009555; ORNL/Sub-79/13837/6) Avail: NTIS HC A15/MF A01

The Foreign Coal Liquefaction Technology survey and Assessment is part of the International Energy Technology Assessment effort. Six countries were chosen. They are Australia, the Federal Republic of Germany (FRG), Japan, New Zealand, South Africa and the United Kingdom. These countries have active coal liquefaction programs, are using or developing technologies that could be used in the US and/or involved with US coal liquefaction programs. The resources that each has and the policies that have been adopted by their governments are presented. Although each of these countries has numerous programs underway or planned, the amount of information available on each program varies. Brief descriptions of the programs are given in the first chapter; the second chapter deals only with those liquefaction projects and gasifiers associated with direct liquefaction for which an adequate amount of reference material could be found. In the third chapter, critical areas common to all or many liquefaction systems are described. DOE

N82-16282# Utah Univ., Salt Lake City. Dept. of Mining, Metallurgical and Fuels Engineering.

CONCEPTS OF FUNDAMENTAL PROCESSES RELATED TO GASIFICATION OF COAL Quarterly Progress Report, Jan. - Mar. 1981

W. H. Wiser Sep. 1981 3 p

(Contract DE-AM03-77SF-01484)

(DE82-000763; DOE/SF-01484/T2) Avail: NTIS HC A02/MF A01

The primary objective of the research on single stage catalytic coal gasification is to optimize the process variables and catalyst systems to maximize yields. The 200 mesh coal will be slurried in a hydrogen donor solvent, tetralin, in a ratio of 2 parts solvent to 1 part coal by weight, and initially a sulfided Ni-W/SiO2-Al2O3 catalyst will be used. All of the required equipment arrived and the system has undergone pressure testing and some minor redesign. The objective of the project on single stage coal gasification to high Btu gas is to investigate the potential for obtaining high methane yields by direct catalytic hydrogenation of coal in a single stage with a maximum temperature of 5500 C. The work completed so far has included a thermodynamic feasibility study which involved investigating the effect of various parameters, temperature, pressure, and steam percent in hydrogen feed. Fifteen experimental runs have been completed. DOE

N82-16283# Pittsburg Univ., Pa. Dept. of Chemical and Petroleum Engineering.

EXPERIMENTAL STUDY OF THE MULTIPLE STEADY STATES IN AN ADIABATIC COAL-LIQUEFACTION REACTOR Annual Report, 1 Sep. 1980 - 31 Aug. 1981

Y. T. Shah and P. C. Singh Sep. 1981 75 p refs

(Contract DE-FG22-80PC-30243)

(DE82-000770; DOE/PC-30243/T2) Avail: NTIS HC A04/MF A01

The purpose of the proposed study is to investigate experimentally the thermal behavior of coal liquefaction reactors. Stability of the steady state is specifically planned to be investigated in the adiabatic continuous stirred tank reactor used in the A-1 unit of the Gulf Research Center. When a reactor has more than one possible temperature for steady state operation, large temperature excursions may result from a small perturbation. An efficient control of temperature is then needed to avoid this type of run away of the reactor. In case of coal liquefaction reactors, below 4500 C no substantial reaction is observed, while above 4650 C there is every possibility of coking of the reactor.

The operating range is thus very narrow and it is undesirable to have temperature excursions. A theoretical investigation of these reactors has shown multiple steady states in pilot plant operations. Industrial coal liquefaction reactors operate very close to an adiabatic mode. DOE

N82-16284# Brigham Young Univ., Provo, Utah.
INVESTIGATION OF SULFUR-TOLERANT CATALYSTS FOR SELECTIVE SYNTHESIS OF HYDROCARBON LIQUIDS FROM COAL-DERIVED GASES Quarterly Technical Progress Report, 19 Mar. - 18 Jun. 1981
C. H. Bartholomew 15 Jul. 1981 32 p refs
(Contract DE-AC01-79ET-14809)
(DE82-000274; DOE/ET-14809/7-7) Avail: NTIS HC A03/MF A01

During the seventh quarter, preparation of the proposed boride-promoted catalysts was completed. An aqueous solution technique was found to improve the preparation of the supported metal boride catalysts. Characterization of 3 and 15% cobalt catalysts by O2 titration ahd H2 and CO chemisorptions showed dispersions to be near 7.3%. Reduction was optimum after 36 hours at 623 K. Activity/selectivity measurements showed Co/SiO2 catalysts to be more active by an order of magnitude than corresponding Fe/SiO2 catalysts in Fischer-Tropsch synthesis. The unsupported cobalt boride was found to be less active, though it produced a higher molecular weight product than similar silica--support cobalt catalysts. H2S deactivation equipment construction and calibration has been completed and preliminary tests performed. DOE

N82-16285# Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering.
DYNAMIC BEHAVIOR OF MOVING-BED COAL-GASIFICATION REACTORS Annual Report, 1 Sep. 1980 - 31 Aug. 1981
B. Joseph Sep. 1981 82 p refs
(Contract DE-FG22-80PC-30219)
(DE82-000595; DOE/PC-30219/T1) Avail: NTIS HC A05/MF A01

A rigorous dynamic model of the two moving-bed coal gasifier was developed. The resulting coupled nonlinear partial differential equations were solved numerically using a digital computer. The model was validated through comparison with steady state pilot plant operating data and with results of existing steady state models. A number of transient studies were conducted using the dynamic mode including response to variations in coal feed rate, steam rate and oxygen feed rate. The internal solid and gas temperature profiles as well as the product gas composition were tracked as a function of time. The stability of the gasifier under various types of feedback control strategies were studied. The results are given in the form of response curves to typical input disturbances. DOE

N82-16286# Southwest Research Inst., San Antonio, Tex. Dept. of Engine and Vehicle Research.
ALTERNATE FUELS IN MEDIUM-SPEED DIESEL ENGINES: OFF-SPECIFICATION DIESEL FUELS, SIMULATED COAL-DERIVED FUEL AND METHANOL
Q. A. Baker Jan. 1981 155 p refs
(Contract DOE-EM-78-C-4266)
(PB81-242562; FRA/ORD-80/40.I; Rept-1) Avail: NTIS HC A08/MF A01 CSCL 21D

The first year of research activity of a multi-year research, development, and demonstration effort to investigate the use of alternate fuels in medium-speed diesel engines is described. Tests were performed on a laboratory two cylinder medium speed diesel engine in an attempt to define its ability to operate on alternate fuels and to define the performance and emission characteristics of the engine under such operation. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-16287# Los Alamos Scientific Lab., N. Mex.
SUMMER-HEAT-GAIN CONTROL IN PASSIVE-SOLAR-HEATED BUILDINGS: FIXED HORIZONTAL OVERHANGS
Robert W. Jones 1981 6 p refs Presented at the Intern. Passive and Hybrid Cooling Conf., Miami Beach, Fla., 11-13 Nov. 1981
(Contract W-7405-eng-36)
(DE81-028700; LA-UR-81-2297; CONF-81109-2) Avail: NTIS HC A02/MF A01

When there is a substantial winter heating requirement, and when the winter heating needs are met in part by a passive solar heating system, then the potential aggravation of summer cooling loads by the heating system is an important design issue. An approach to quantitative design rules for the sizing of a shading overhang to minimize total annual space conditioning energy needs is outlined. DOE

N82-16288# Oak Ridge National Lab., Tenn. Engineering Technology Div.
DEVELOPMENT OF ADVANCED BUILDING MATERIALS FOR THE PASSIVE SOLAR APPLICATION
J. J. Tomlinson 1981 5 p refs Presented at the Thermal Energy Storage Ann. Contr. Rev. Meeting, Washington, D.C. 14-16 Sep. 1981
(Contract W-7405-eng-26)
(DE81-032009; CONF-810940-7) Avail: NTIS HC A02/MF A01

A program to develop the concept of incorporation of phase change materials (PCMs) into conventional building materials has been initiated and consists of in-house analyses to characterize the thermal performance of a porous matrix suffused with a PCM, and concept experimental development through subcontracted efforts. The program is directed toward the development of material concepts which provide greater collection/storage efficiency and increased levels of thermal comfort in direct gain passive solar applications. DOE

N82-16289# Water and Power Resources Service, Denver, Colo. Geotechnical Branch.
CLOSED-SYSTEM FREEZING OF SOILS IN LININGS AND EARTH EMBANKMENT DAMS
Chester W. Jones Mar. 1981 56 p refs
(PB81-240491; REC-ERC-81-1) Avail: NTIS HC A04/MF A01 CSCL 13B

A brief review of studies of closed-system freezing (no source of water except that in voids) of compacted soil canal linings, laboratory and field test results show that under certain soil and temperature conditions, freezing decreases soil density near the surface, but increases density at depth. In two linings, the average density increased slightly during a 20-year period. Frost penetration measurements made during the 1978-79 winter on a 1.5-thick reservoir lining, on three earth dams under construction, and on the Teton Dam remnant are shown along with associated soil conditions, air freezing indexes, and insulating effects of snow and, for one dam, a loose soil cover. Author

N82-16290# Utah Dept. of Transportation, Salt Lake City. Materials and Research Station.
EVALUATION OF FLEXIBLE PAVEMENT CRACK SEALING METHODS USED IN UTAH Final Report
Michael C. Belangie and Douglas I. Anderson Jan. 1981 121 p refs Sponsored by Federal Highway Administration
(PB81-239469; UDOT-MR-81-1; FHWA/UT-81/1) Avail: NTIS HC A06/MF A01 CSCL 13B

Criteria to improve the effectiveness of Utah's flexible pavements crack sealing practice were studied. Field measurements, in-depth interviews questionaires were used. Findings indicate that flexible pavement cracking is a significant problem in the Far West, Rocky Mountains, Great Lakes and New England. Choice of materials is effected by storage requirements and equipment available. Prepackaging of materials designed for crack sealing has resulted in improvements in control of mix and material properties. Low temperature and freeze thaw cycles significantly effect the amount of thermal cracking and the performance of crack sealant. Ductile sealants, such as Crumb rubber/asphalt cement mixes, in combination with routing appear to offer substantial gains in sealant life and performance. M.D.K.

N82-16291# URS/Blume (John A.) and Associates, San Francisco, Calif.

EARTHQUAKE ENGINEERING OF LARGE UNDERGROUND STRUCTURES Final Report, Apr. 1978 - Sep. 1980

G. Norman Owen and Roger E. Scholl Jan. 1981 299 p refs Sponsored in part by Federal Highway Administration

(Grant NSF PFR-77-06505)

(PB81-247918; JAB-7821; FHWA/RD-80/195) Avail: NTIS HC A13/MF A01 CSCL 13B

The current state of the art of earthquake engineering of transportation tunnels and other large underground structures is evaluated. A review of the past performance of 127 underground openings during earthquakes indicates that underground structures in general are less severely affected than surface structures at the same geographic location. However, some severe damage, including collapse, has been reported. Stability of tunnels during seismic motion is affected by peak ground motion parameters, earthquake duration, type of support, ground conditions, and in situ stresses. The literature on the nature of underground seismic motion is reviewed in detail. Although recorded underground motions tend to substantiate the idea that motion does reduce with depth, amplification at depth has been observed. GRA

N82-16292# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.

EXPERIMENTAL PAVEMENT DELINEATION TREATMENTS Interim Report

James E. Bryden and Ronald A. Lorini Jun. 1981 42 p refs (PB81-249161; RR-81-87; FHWA/NY/RR-81/87; IR-2) Avail: NTIS HC A03/MF A01 CSCL 13B

Visibility and durability of materials used to delineate shoulders and medians adjacent to asphalt pavements were evaluated. Materials evaluated were polysulfide and coal tar epoxies, one and two component polyesters, portland cement, acrylic paints, modified-alkyd traffic paint, preformed plastic tape, and thermoplastic markings. Neat applications, sand mortars, and surface treatments were installed in several geometric patterns including cross hatches, solid median treatments, and various widths of edge lines. Thermoplastic pavement markings generally performed very well, providing good visibility under adverse viewing conditions for at least 4 years. Thermoplastic 4 in. wide edge lines appear to provide adequate visibility for most conditions. Author

N82-16293# Florida State Dept. of Transportation, Gainesville. Office of Materials and Research.

LABORATORY PAVEMENT POLISHING DEVICE (WEAR MACHINE) VERSUS FIELD FRICTION TEST UNITS AND ACCUMULATIVE TRAFFIC (ADT). PHASE 2. CORRELATION STUDY Final Report

H. F. Godwin, D. B. Loyed, W. G. Miley, and G. C. Page Apr. 1981 63 p refs

(PB81-233256; FL/DOT/OMR-81/240; FHWA/FL-81/240) Avail: NTIS HC A04/MF A01 CSCL 13B

The degree to which pavement wear (vehicular traffic) could be predicted from testing samples of in-service pavements in the laboratory pavement polishing device was determined. This investigation was made on asphaltic concrete pavements, primarily friction courses used in Florida. These pavements were tested at different levels of accumulative traffic (ADT) for approximately 2 years. T.M.

N82-16294# Federal Highway Administration, Washington, D.C. Structures and Applied Mechanics Div.

A PRELIMINARY EVALUATION OF THE SYSTEM FOR INVENTORYING ROAD SURFACE TOPOGRAPHY (SIRST) Evaluation Report, Jun. 1979 - May 1980

J. C. Wambold and L. C. Meczkowski Jul. 1981 45 p

(PB81-249336; FHWA/RC-81/089) Avail: NTIS HC A03/MF A01 CSCL 13B

A brief overview of a System for Inventorying Road Surface Topography (SIRST) is described. A description of the operating principle is given as well as a description of the individual components. A preliminary evaluation of the system and its components is included, together with a discussion of the operating experience. It is concluded that the present system is usable; however, a more complete evaluation and further development are needed to adapt the system for highway department use. Several modifications are recommended for over the road environment and ease of calibration. GRA

N82-16295# Applied Research Association, Inc., Albuquerque, N. Mex.

EVALUATION OF THE FEASIBILITY OF ESTABLISHING A NATIONAL TESTING CAPABILITY FOR THE SIMULATION OF EARTHQUAKE LOADS ON LARGE-SCALE STRUCTURES

Cornelius J. Higgins and D. W. Steedman Mar. 1981 57 p refs

(Grant NSF PFR-80-09884)

(PB81-243875; NSF/CEE-81018) Avail: NTIS HC A04/MF A01 CSCL 13M

Literature investigations and communications with engineers and scientists active in the field of earthquake engineering were conducted. The need for large-scale testing, high priority projects, test facility requirements, management concepts, and funding requirements were evaluated. There was a consensus that there is strong justification for a national large-scale testing program. Testing is needed to allow thorough investigation of the nonlinearities and inelasticities in the behavior of realistic structures as they approach their ultimate capacity. The definition of large-scale, the place of large-scale testing in the overall scheme of earthquake engineering research, the planning and cost estimating for the development of test support requirements, and a management concept integrating the capabilities and interests of university, industry, consulting, and government engineers and scientists were topics addressed. M.D.K.

N82-16296# National Bureau of Standards, Washington, D.C. Center for Building Technology.

BUILDING TECHNOLOGY PROJECT SUMMARIES, 1980 - 1981

Noel Raufaste and Michael Olmert Jul. 1981 89 p

(PB82-106105; NBS-SP-446-5) Avail: NTIS HC A05/MF A01 CSCL 13M

The mission of the Center for Building Technology (CBT) is to increase the usefulness, safety, and economy of buildings through the advancement of building technology and its application to the improvement of building practice. CBT's research activities support the building technology programs of Federal, State, and local governments; assist the design professions, building officials, and the research community by developing improved design criteria; and assist manufacturers of building products by developing methods for evaluating innovative materials, components, and systems. CBT provides an objective source of technical information for national consensus standards and model code organizations. Close cooperation with these groups leads to standard practices that meet the needs of the regulatory authorities of State and local governments. Research providing the knowledge for these standard practices is conducted in cooperation with Government, university, and industry laboratories. This report summarizes CBT's research for 1980-1981. GRA

N82-16297# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.

DESIGN FOR MANUFACTURABILITY: DESIGN FOR FORGING, PART 2 M.S. Thesis

A. Rigioni and G. Boothroyd Apr. 1981 122 p refs

(Grant NSF APR-77-10197)

(PB82-101692; NSF/MEA-81009-Pt-2; Rept-13) Avail: NTIS HC A06/MF A01 CSCL 13H

Practical design recommendations for conventional forgings are presented. Recommendations are considered for the design of individual features such as ribs, depressions, and holes. Forging tolerances and allowances, as well as forging drafting practices, are explained. Included are some guidelines for evaluating parting line location. Forging design data sheets are described, including a brief explanation of how they were obtained. The use of the handbook is illustrated by means of a practical example, outlining all of the necessary steps in the design of a forged product. The appendix contains a list of forging terms and their definitions. GRA

N82-16298# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

EVALUATION OF MAINTENANCE/REHABILITATION ALTERNATIVES FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT Interim Report, 1978 - 1981
Terry L. Barnett, Michael I. Darter, and Ned R. Laybourne May 1981 152 p refs Prepared in cooperation with the Illinois State Dept. of Transportation, Springfield and DOT
(PB82-105792; TRANSPORTATION-ENGR-SER-28; UIUC-ENG-80-2011; FHWA/IL/UI-185) Avail: NTIS HC A08/MF A01 CSCL 13C

The design, construction, performance, and costs of several maintenance and rehabilitation methods were evaluated. Patching, cement grout and asphalt undersealing, epoxying of cracks, and an asphalt overlay were considered. Nondestructive testing, deflections, reflection cracking, cost, and statistical analyses were used to evaluate the methods. Author (GRA)

N82-16299# National Bureau of Standards, Washington, D.C.
FACTORS AFFECTING THE SOUNDNESS OF BLENDED CEMENTS
Paul Wencil Brown and James R. Clifton Jun. 1981 27 p refs Sponsored in part by DOE
(PB82-104746; NBSIR-81-2273) Avail: NTIS HC A03/MF A01 CSCL 13C

Blended cements containing fly ash and blast furnace slag were examined to assess their soundness in the presence of admixed MgO. Measurements of linear expansion were combined with compressive strength determinations to evaluate the volume stabilities of samples cured under various conditions. The effects of magnesium silicate formation on volume stability were also examined. Author

N82-16300# Institut Rudjer Boskovic, Zagreb (Yugoslavia).
DEVELOPMENT OF STRENGTH IN CEMENTS Interim Report, Sep. 1977 - Sep. 1978
B. Matkovic Washington Federal Highway Administration Apr. 1981 149 p refs Sponsored in part by DOT and Yugoslav Joint Board on Scientific and Technological Cooperation
(PB82-103979; FHWA/RD-80/128) Avail: NTIS HC A07/MF A01 CSCL 13C

The production of doped belite (dicalcium silicate) clinkers as a prospective means for saving energy in Portland cement production is described. This is accomplished by small additions of either barium sulfate (BaSO4), calcium tribasic phosphate (Ca5(PO4)3OH), or vanadium oxide (V2O5) to belite (Ca2SiO4) clinker. In addition to conserving energy, doping the belite with barium sulfate imparts greater strength to the resulting modified belite. Reactants, additives, and factors contributing to the fabrication of Sorel cement are described. Author (GRA)

N82-16301# GAI Consultants, Inc., Monroeville, Pa.
INVESTIGATION OF THE USE OF COAL REFUSE-FLY ASH COMPOSITIONS AS HIGHWAY BASE COURSE MATERIAL Final Report, Oct. 1977 - Sep. 1980
Paul V. McQuade, W. J. Head, and Robert B. Anderson Jun. 1981 68 p Prepared in cooperation with West Virginia Univ., Morgantown
(Contract DOT-FH-11-9324)
(PB82-101940; FHWA/RD-80/129; Rept-77-522) Avail: NTIS HC A04/MF A01 CSCL 13C

The utilization of coal refuse-fly ash compositions as highway base course material is surveyed. The results of a laboratory testing program into the physical and engineering properties of mixtures of these waste products are presented. A comparison of serviceability index and physical damage parameters based on the VESYS Predictive Design Procedure between crushed stone and coal refuse-fly ash compositions are presented. These findings indicate that substituting stabilized coal refuse-fly ash blends in place of conventional base course material is technically and economically feasible. Procedures for developing design mixes and conducting field tests of coal refuse-fly ash base course material are described. Author

N82-16302# Portland Cement Association, Skokie, Ill. Construction Technology Labs.
EVALUATION OF SUPER-WATER REDUCERS FOR HIGHWAY APPLICATIONS Final Report
D. Whiting Washington Federal Highway Administration Mar. 1981 184 p refs
(Contract DOT-FH-11-9258)
(PB82-101106; FHWA/RD-80/132) Avail: NTIS HC A09/MF A01 CSCL 13C

Super-water reducers were characterized and evaluated as potential candidates for production of low water to cement ratio, high strength concretes for highway construction applications. Admixtures were composed of either naphthalene or melamine sulfonated formaldehyde condensates. A mini-slump procedure was used to assess dosage requirements and behavior of workability with time of cement pastes. Required dosage was found to be a function of tricalcium aluminate content, alkali content, and fineness of the cement. Concretes exhibited high rates of slump loss when super-water reducers were used. The most promising area of application of these products appears to be in production of dense, high cement content concrete using mobile concrete mixer/transporters. Author (GRA)

N82-16303# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
MECHANISTIC INTERPRETATION OF NONDESTRUCTIVE PAVEMENT TESTING DEFLECTIONS Interim Report
M. S. Hoffman and M. R. Thompson Jun. 1981 262 p refs Sponsored in part by Illinois State Dept. of Transportation
(PB82-107095; TRANSPORTATION-ENGR-SER-32; UILU-ENG-81-2010; FHWA/IL/UI-190) Avail: NTIS HC A12/MF A01 CSCL 13B

A method for the back calculation of material properties in flexible pavements based on the interpretation of surface deflection measurements is proposed. The ILLI-PAVE, a stress-dependent finite element pavement model, was used to generate data for developing algorithms and nomographs for deflection basin interpretation. Twenty four different flexible pavement sections throughout the State of Illinois were studied. Deflections were measured and loading mode effects on pavement response were investigated. The factors controlling the pavement response to different loading modes are identified and explained. Correlations between different devices are developed. The back calculated parameters derived from the proposed evaluation procedure can be used as inputs for asphalt concrete overlay design.
Author (GRA)

N82-16304# Massachusetts Inst. of Tech., Cambridge. Lab. for Manufacturing and Productivity.
EXPLORATORY STUDY OF CONSTRAINTS ON DESIGN BY FUNCTIONAL REQUIREMENTS AND MANUFACTURING Annual Report, 1979 - 1980
Nam P. Suh, Adam C. Bell, David R. Wilson, and James R. Rinderle Jan. 1981 146 p refs
(Grant NSF DAR-77-13296)
(PB82-101858; LMP/AXM-81-02; NSF/MEA-81008) Avail: NTIS HC A07/MF A01 CSCL 13H

Some of the concepts and terminology of the axiomatic approach to design and manufacturing are presented. The manner in which this approach fits into the overall design process is illustrated. Two axioms are derived: maintain the independence of functional requirements; and minimize the information content. Coupling in a design as it relates to the first axiom is discussed. Some quantitative measures of coupling are presented with examples to illustrate the concepts of coupled and uncoupled designs. The issue of complexity in design and manufacturing is considered, including the relativity and consequences of a particular measure of complexity. Author

N82-16305# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
WATER REPELLENT SOILS: A STATE-OF-THE-ART Final General Technical Report
Leonard F. DeBano Mar. 1981 27 p refs
(PB81-248270; FSGTR-PSW-46) Avail: NTIS HC A03/MF A01 CSCL 08M

Most problems of water repellancy in soils arise because of poor infiltration, difficulties in establishing plants, increased runoff and erosion, and plant diseases. An especially acute problem in southern California is the relationship between these soils and the high rates of runoff and erosion of freshly burned watersheds. Water repellent substances are beneficial in harvesting water and reducing evaporation losses. These same substances provide a practical method of improving soil structure and

aggregate stability. Much is known about the physics of water movement through these soils and the role of fire in their formation. GRA

N82-16306# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
TECHNOLOGY FOR IMPROVING THE WEAR RESISTANCE OF AGGREGATES BY MATERIALS IMPREGNATION Final Report, May 1977 - Dec. 1980
Ronald P. Webster and Jack J. Fontana Aug. 1981 80 p refs
(Contract DOT-FH-7-3-0070)
(PB81-246191; FHWA/RD-81/115) Avail: NTIS HC A05/MF A01 CSCL 13C

Tests performed to evaluate the effect of impregnation on the physical, mechanical, wear resistance and polish resistance properties of the aggregates included: petrographic analysis, Los Angeles abrasion loss, sodium sulfate soundness loss, the British polish wheel, aggregate surface microtexture analysis, and two circular test track studies. Impregnants studied included: MMA based and styrene based monomer systems, water based phenol formaldehyde resin, and sodium silicate. In general, it was found that the physical and mechanical properties of natural aggregates can be significantly improved by impregnation. Significant improvements in wear resistance can also be obtained, however, in some instances, this improvement is accompanied by a decrease in polish resistance. T.M.

N82-16307# Purdue Univ., Lafayette, Ind. Office of Joint Highway Research Project.
THIN, APPLIED SURFACING FOR IMPROVING SKID RESISTANCE OF CONCRETE PAVEMENTS Final Report
Charles F. Scholer 3 Dec. 1980 29 p Sponsored in part by Indiana State Highway Commission
(PB81-247744; JHRP-80-16; FHWA/IN/JHRP-80/16) Avail: NTIS HC A03/MF A01 CSCL 13B

The use of select aggregate in a thin wearing surface of portland cement mortar to prolone or restore a concrete pavement's ability to develop high friction was accomplished. Two fine aggregates, blast furnace slag and lightweight expanded shale were found to exhibit skid resistance greater than the other aggregates evaluated. The British polishing wheel was used in the laboratory evaluation of aggregate to simulate wear. The need for a method of restoring friction to a worn, but otherwise sound concrete pavement led to a field evaluation of several different techniques for placing a very thin overlay. The successful method was a broomed, very thin layer of mortar, 3 mm thick. GRA

N82-16308# National Bureau of Standards, Washington, D.C. Automated Production Technology Div.
PRECISION MEASUREMENTS ON FIBROUS GLASS INSULATION
B. Branthover, R. Veale, and C. Siu Nov. 1980 37 p refs
(PB81-239634; NBSIR-80-2091) Avail: NTIS HC A03/MF A01 CSCL 13C

A technique for measuring the thickness of low density fibrous glass materials is investigated. The method of measurement described provides a higher degree of accuracy than previously accomplished. The procedure determined a specific force to be used for measuring. Also, a stacking technique was carried out to see what effect placing a number of test samples on top of each other would have. The results of the entire testing will aid in the development of a standard reference material be used for thermal resistance measurement systems. GRA

N82-16309# Transportation Research Board, Washington, D.C.
BRIDGE AND PAVEMENT MAINTENANCE
Michael W. Fitzpatrick, David A. Law, William C. Dixon, Gary E. Elkins, B. Frank MuCullough, Michael I. Darter, Eldon J. Yoder, R. H. Florence, Jr., Stanley J. Virkler, K. H. McGhee et al 1981 56 p refs
(PB81-247504; TRB/TRR-800; ISSN-0361-1981) Avail: NTIS HC A04/MF A01 CSCL 13B

Deterioration of New York State Highway structures; precast repair of continuously reinforced concrete pavement (abridgment) patching of continuously reinforced concrete pavements, evaluation of several maintenance methods for continuously reinforced concrete pavement, patching jointed concrete pavements, highway pavement repairs by using polymer concrete, pressure grouting of concrete pavements, and choosing cost-effective maintenance are discussed. Author

N82-16310# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
THE OPTIMAL PLANNING OF COMPUTERIZED MANUFACTURING SYSTEMS
William C. Lewis, Jr., Moshe M. Barash, and J. J. Solberg Dec. 1980 207 p refs
(Grant NSF APR-74-15256)
(PB81-241564; NSF/RA-800556; REPT-18) Avail: NTIS HC A10/MF A01 CSCL 13H

A new class of control algorithms for computer operated manufacturing systems (CMS) was defined and tested. The definition is sufficient to permit construction of any element of the new class by a practitioner with backgrounds in electronic devices, NC machine tools, computer operating systems, and data flow. Reliability, repairability, and extensibility were considered. The test applied the new class to control two simulated systems-one similar to existing systems, the other using adaptive machine tools. For each system, the new class functioned successfully. Non-failing machine tool utilization exceeded 95 percent for failure rates from 3-16 percent per machine tool. The batch weights had a strong effect on relative flow time. GRA

N82-16311# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
THE OPTIMAL PLANNING OF COMPUTERIZED MANUFACTURING SYSTEMS
M. M. Barash, E. Bartlett, I. I. Finfter, and W. C. Lewis, Jr. Dec. 1980 98 p refs
(Grant NSF APR-74-15256)
(PB81-245276; NSF/RA-800555; REPT-17) Avail: NTIS HC A05/MF A01 CSCL 13H

An automated machining process planning systems is demonstrated. Enough information is given to construct any member of the class, which is characterized by use of a recursive algorithm. The algorithm emphasizes the use of one well-defined tool, in one way, at each step of a process plan. Functioning is demonstrated by a Pascal program. Testing the generality of the system is proposed. The project illustrates application of selected software development methods to make the software compatible with social verification. GRA

N82-16312# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
THE OPTIMAL PLANNING COMPUTERIZED MANUFACTURING SYSTEMS
M. F. Neuts, D. M. Lucanton, and C. Geiszler Feb. 1981 35 p refs
(Grant NSF APR-74-15256)
(PB81-245284; NSF/MEA-81006; Rept-19) Avail: NTIS HC A03/MF A01 CSCL 13H

The utility of interactive computation in answering questions on the behavior, design, and control of certain service systems is demonstrated. The stationary distributions of various waiting times are also discussed. A queue with N servers which may break down and require repair at a facility which has C repair crews is studied. Under exponential assumptions, this model has an algorithmically tractable solution. It is then a particular case of the M/M/n queue in a Markovian environment. It is shown that during periods when most servers are down, large build-ups may occur which affect the queue adversely for a long time afterwards. Potential applications are in manpower planning, as in a typing pool where persons may be absent, and in determining the size of a battery of machines, where machines may be inoperative due to maintenance and repair. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-16313*# Ohio State Univ., Columbus. ElectroScience Lab.

UTD ANALYSIS OF ELECTROMAGNETIC SCATTERING BY FLAT STRUCTURES Ph.D. Thesis

F. A. Sikta and Leon Peters, Jr. Dec. 1981 389 p refs (Grant NsG-1613)

(NASA-CR-165099; TR-711930-2) Avail: NTIS HC A17/MF A01 CSCL 20N

The different scattering mechanisms that contribute to the radar cross of finite flat plates were identified and analyzed. The geometrical theory of diffraction, the equivalent current and the corner diffraction are used for this study. A study of the cross polarized field for a monopole mounted on a plate is presented, using novel edge wave mechanism in the analysis. The results are compared with moment method solutions as well as measured data. J.D.H.

N82-16314*# City Univ. of New York, N. Y. Communications Systems Lab.

COMPUTER SIMULATOR FOR A MOBILE TELEPHONE SYSTEM Technical Report, 1 Nov. 1980 - 31 Oct. 1981

Donald L. Schilling 31 Oct. 1981 105 p refs (Grant NAG3-119)

(NASA-CR-164808) Avail: NTIS HC A06/MF A01 CSCL 17B

A software simulator was developed to assist NASA in the design of the land mobile satellite service. Structured programming techniques were used by developing the algorithm using an ALCOL-like pseudo language and then encoding the algorithm into FORTRAN 4. The basic input data to the system is a sine wave signal although future plans call for actual sampled voice as the input signal. The simulator is capable of studying all the possible combinations of types and modes of calls through the use of five communication scenarios: single hop systems; double hop, signal gateway system; double hop, double gateway system; mobile to wireline system; and wireline to mobile system. The transmitter, fading channel, and interference source simulation are also discussed. A.R.H.

N82-16315*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

DEVELOPMENT OF A SURFACE PANEL MEASUREMENT SYSTEM Final Report

D. L. Jones 4 Aug. 1981 57 p refs Prepared for JPL (Contracts NAS7-100; JPL-955987)

(NASA-CR-163469; JPL-9950-600) Avail: NTIS HC A04/MF A01 CSCL 17I

Reflector measurement systems are studied in support of the reshaping of the 34 meter antenna at Goldstone. The requirements for measurement systems are presented. A survey is made of the surface errors of existing antennas. Reflector measurement systems are divided into three categories and representative examples of each category are illustrated and discussed. Parametric error analyses are made of selected optical systems. The existing measurement method using a theodolite at the vertex is retained. A method using a theodolite on the RF cone is a possible variant. S.L.

N82-16316# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Uebertragungstechnik und Elektroakustik.

DIGITAL SINGLE SIDEBAND MODULATORS FOR ANALOG SIGNALS [DIGITALE EINSEITENBANDMODULATOREN FUER ANALOGSIGNALE]

K. Hoffmann and N. Roethe Mar. 1981 32 p refs In GERMAN

(IND-FB-105) Avail: NTIS HC A03/MF A01

Digital system application of single sideband and modulators to analog signals is discussed. The characteristics and applications of the single sideband systems are described. The general preparation for analog techniques is reviewed. The digital, time discrete realization of these preparations is analyzed. A complete dimensional modulator for the finished product and the application of the digital process is shown. Transl. by E.A.K.

N82-16317# Teledyne Micronetics, San Diego, Calif.

ADAPTIVE PROCESSING FOR LOW RCS TARGETS Final Technical Report, Apr. 1979 - Feb. 1980

Lee A. Morgan and Steven Weisbrod Griffiss AFB, N.Y. RADC Aug. 1981 50 p refs

(Contract F30602-79-C-0142; AF Proj. 4506)

(AD-A106685; R8-80) Avail: NTIS HC A03/MF A01 CSCL 17/9

An adaptive system to determine and transmit a radar signal matched to a target's impulse response was designed, breadboarded and tested. The application is to targets which consist of discrete point-like scatterers. A pilot signal consisting of a single short pulse is transmitted. The return from this pilot pulse is range gated in a network which generates a piecewise approximation of the conjugate of the impulse response. This approximation becomes the matched signal which is then transmitted. The system was demonstrated to provide nearly theoretical target enhancement even when the pilot pulse return was at the receiver noise level. Operation under situations where the target-impulse response was changing was also demonstrated. Problem areas in the implementation are described. Author (GRA)

N82-16318# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany).

HIGH ALTITUDE ATMOSPHERIC INVESTIGATIONS. PART 2: DEVELOPMENT OF IN-SITU EXPERIMENTS FOR MEASUREMENTS IN THE D-REGION OF THE IONOSPHERE AND THEIR RESULTS Final Report, 1 Aug. 1975 - 1 Aug. 1980

Hans-Ulrich Widdel 3 Jun. 1981 118 p refs

(Grant DA-ERO-75-G-076; DA Proj. 1T1-61102-BH-57)

(AD-A106770) Avail: NTIS HC A06/MF A01 CSCL 20/14

Results of A3 absorption, radio absorption measured from the ground is determined by the integral over the electron density weighted with the collision frequency of the electrons with the ambient neutral gas. The boundaries of the relevant conditions are difficult to establish. Absorption is also affected by properties of the ionosphere, and these properties change with seasons, Sun position, and other factors. These multiple effectors make unambiguous interpretation impossible. The report describes attempts to select and describe parameters that might most strongly influence radio wave absorption. Technical details of in-situ experiments to measure wind and electron density are communicated and some results obtained with these instruments are presented. It was found that the ratio between the positive ion current and the electron current measured with the guarding probe experiment is affected by both, the ion composition in the ion sheath and by neutral air temperature. This might explain the ambiguities found when a direct comparison of results obtained with 'Langmuir' probes and wave propagation experiments is attempted. The effect might be used to derive local air temperatures provided that the ion composition of the ion sheath is known and that a quantitative theoretical description can be established. Author (GRA)

N82-16319# Computer Systems Management, Inc., Arlington, Va.

THE DESIGN, DEVELOPMENT, DEMONSTRATION, AND TRANSFER OF ADVANCED COMMAND AND CONTROL (C2) COMPUTER-BASED SYSTEMS Final Technical Report, 1 Jul. - 31 Oct. 1981

James F. Wittmeyer, III 31 Oct. 1981 35 p refs

(Contract MDA903-80-C-0155; ARPA Order 3829)

(AD-A106787; CSM-81-04) Avail: NTIS HC A03/MF A03 CSCL 09/2

The design, development, demonstration, documentation, and transfer of advanced C2 computer- and video-based systems is enhanced by systematic requirements, user assessments, and prudent software engineering. New opportunities lie in the video disc, networking, and micrographic systems areas, with applications in the unconventional documentation, information management, and advanced systems design, among other areas. GRA

N82-16320# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.

PROPAGATION OF TRANSIENT SIGNALS THROUGH NONLINEAR, IONIZED MEDIA Final Report, 30 Sep. 1978 - 30 Jun. 1981

Robert E. McIntosh 30 Jun. 1981 8 p
(Grant AF-AFOSR-3729-78; AF Proj. 2310)
(AD-A106754; AFOSR-81-0698TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

The diurnal and random motion of the ionosphere cause both translation and spreading of the frequency spectrum of signals transmitted through it. A predictive model was built and compared to experimental data and found to successfully predict frequency shifts and spreads induced by ionospheric inhomogeneities. Another model was developed to describe the reflection of HF pulses by a randomly inhomogeneous, dispersive and absorptive ionosphere. It is seen that delay distortion, diffuse multipath and frequency incoherence effects are small compared to the discrete multipath spread resulting from large scale variations of the ionospheric electron number density. In laboratory experiments the electron number density profile of a low pressure RF-generated Argon plasma was measured concurrently using microwave and optical diagnostic techniques. In a peripheral study, interesting results in antenna performance for efficient pulse radiation were found. Author (GRA)

N82-16321# Stanford Univ., Calif.

RESEARCH ON ALGORITHMS FOR ADAPTIVE ANTENNA ARRAYS Annual Interim Report, Dec. 1979 - Dec. 1980

Bernard Widrow, W. Newman, R. Gooch, K. Duvall, and D. Shur Griffiss AFB, N.Y. RADC Aug. 1981 97 p refs
(Contract F30602-80-C-0046; AF Proj. 2305)
(AD-A106684; RADC-TR-81-206) Avail: NTIS HC A05/MF A01 CSCL 09/5

The fundamental efficiency of adaptive algorithms is analyzed. It is found that noise in the adaptive weights increases with convergence speed. This causes loss in mean-square-error performance. Efficiency is considered from the point of view of misadjustment versus speed of convergence. A new version of the LMS algorithm based on Newton's method is analyzed and shown to make maximally efficient use of real-time input data. The performance of this algorithm is not affected by eigenvalue disparity. Practical algorithms can be devised that closely approximate Newton's method. In certain cases, the steepest descent version of LMS performs as well as Newton's method. The efficiency of adaptive algorithms with nonstationary input environments is analyzed where signals, jammers, and background noises can be of a transient and nonstationary nature. A new adaptive filtering method for broadband adaptive beamforming is described which uses both poles and zeros in the adaptive signal filtering paths from the antenna elements to the final array output. GRA

N82-16322# Ohio State Univ., Columbus. ElectroScience Lab.

A STUDY OF EIGENVALUE BEHAVIOR IN ADAPTIVE ARRAYS M.S. Thesis

Kah-jing Suen Aug. 1981 81 p refs
(Contract N00019-81-C-0093)
(AD-A106544; ESL-713603-2) Avail: NTIS HC A05/MF A01 CSCL 20/14

This report discusses the eigenvalues of the covariance matrix for an N-element LMS adaptive array. The effects of the signal and array parameters on these eigenvalues are discussed. A simple relation between the array output SINR and one of the eigenvalues is obtained for the case of strong interference and CW signals. Author (GRA)

N82-16323# Ohio State Univ., Columbus. ElectroScience Lab.

ADVANCED ADAPTIVE ANTENNA TECHNIQUES Final Quarterly Report

R. T. Compton, Jr. Apr. 1981 12 p refs
(Contract ZN00019-80-C-0181)
(AD-A106545; ESL-712684-9) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report describes progress under Naval Air Systems Command Contract N00019-80-C-0181 during the fourth quarterly period. Research on advanced adaptive antenna techniques is summarized. Author (GRA)

N82-16324# Naval Underwater Systems Center, New London, Conn. Submarine Electromagnetic Systems Dept.

VLF/LF/MF WHISPERING GALLERY PROPAGATION STUDIES

Peter R. Bannister 9 Sep. 1981 46 p refs
(AD-A106517; NUSC-TR-6503) Avail: NTIS HC A03/MF A01 CSCL 20/14

The propagation of very low frequency (VLF) and low frequency (LF) radio waves in the Earth-ionosphere waveguide is affected profoundly by the Earth's curvature. In particular, for frequencies greater than about 20 kHz, some modes are possible for which the energy is concentrated near the base of the ionosphere and the field strength near the ground is small. It is useful to think of such modes as being composed of waves repeatedly reflected at the inside surface of the ionosphere. Using analogy with sound waves, we can call these modes whispering--gallery modes. Since they depend only very slightly on ground conductivity, these modes are also referred to as Earth-detached modes. The Navy currently is pursuing efforts leading to a feasibility demonstration of a balloon gateway communications system that would employ a balloon-to-balloon cross link based on the whispering-gallery propagation modes. This report discusses some recent whispering-gallery theoretical advances and simplifications. Author (GRA)

N82-16325# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

KAFJORD, NORWAY TRANSMISSION LINE VLF ANTENNA TESTS, 1979 - 1980

M. H. Dazey 15 Sep. 1981 41 p refs
(Contract F04701-80-C-0081; Grant NSF ATM-77-19361)
(AD-A106430; TR-0081(6960-06)-3; SD-TR-81-80) Avail: NTIS HC A03/MF A01 CSCL 17/2

The 100 kW Transportable Very-Low-Frequency (TVLF) system was used at Kafjord, Norway, for transmissions to the SCATHA and GEOS spacecraft. A 22 kV 14 km long transmission line was used as an antenna. Modifications were made in the line to reduce telephone interference, and components were designed and installed to reduce the resonant frequency and increase the antenna current. Final practical operating current was 40 amperes at 1280 Hz, which resulted in power dissipation of 72 kW and an estimated radiated power of 29 watts. Author (GRA)

N82-16326# General Dynamics Corp., San Diego, Calif. Electronics Div.

WAVE PROPAGATION THROUGH AXIALLY SYMMETRIC DIELECTRIC SHELLS Final Technical Report, 12 Dec. 1979 - 30 Jun. 1981

G. Tricoles, E. L. Rope, and R. A. Hayward Jun. 1981 100 p refs
(Contract N00019-79-C-0638)
(AD-A106762; R-81-125) Avail: NTIS HC A05/MF A01 CSCL 17/9

Radomes significantly reduce missile guidance accuracy by producing boresight error (BSE), an error in target direction as determined by a seeker or radar system. Despite decades of development and use, radomes are a problem because newer missiles require small angular rates of change of BSE and because newer seekers have greater frequency bandwidths. The electromagnetic design process, for boresight error and bandwidth, is largely empirical because radome shapes are non-separable, making analysis approximate. The need for improving radome performance motivates efforts to improve analytical methods. The purpose of the research is to develop improved methods for analyzing radome electromagnetic effects. The main goals are as follows: Develop a geometric theory of diffraction (GTD) for dielectrics and in particular hollow dielectric shells. Extend the moment method for use with hollow dielectric shells. The GTD is intended to be relatively simple, and the moment method is intended to be accurate although more complex than the GTD. Author (GRA)

N82-16327# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

ANALYSIS OF MAXIMIN MATCHED-FILTER DESIGN FOR COMMUNICATION THROUGH A NONLINEARLY DISTORTING CHANNEL M.S. Thesis

Clifton J. Alston 1981 41 p refs
(AD-A106789; AFIT-CI-81-13T) Avail: NTIS HC A03/MF A01 CSCL 17/2

This thesis describes a study of the problem of antipodal signalling through a nonlinearly distorting channel. Maximin design criteria are presented, and general expressions are derived for the robust filter and its performance in terms of the eigenfunctions and eigenvalues of certain additive noise autocorrelations. In particular, the results of baseband detection in triangular-kernel noise, ideally bandlimited noise, and the Wiever noise processes are presented. Author (GRA)

N82-16328# Naval Ocean Systems Center, San Diego, Calif.

SKYWAVE COMMUNICATION TECHNIQUES. DECISION FEEDBACK EQUILIZATION FOR SERIALLY MODULATED SPREAD-SPECTRUM SIGNALS IN THE HF BAND YIELDS IMPROVED RELIABILITY Final Report, 1977 - 1981

L. E. Hoff and A. R. King 30 Mar. 1981 56 p refs
(AD-A106380; NOSC/TR-709) Avail: NTIS HC A04/MF A01 CSCL 17/2

Summarizes the Skywave Communication task. Presents some results of the work on wide-band channel modeling, adaptive equalization, and the field test, which demonstrated that serial modulation spread-spectrum signals can be used to provide reliable communication at HF under multipath conditions. Author

N82-16329# ARO, Inc., Arnold Air Force Station, Tenn.

MULTIPOLE EXPANSION FOR TRANSIENT ELECTRIC AND MAGNETIC FIELDS IN AN INTERNALLY EXCITED SPHERICAL CAVITY CONTANING DAMPERS OF FINITE THICKNESS WITH DISTRIBUTED ELECTRICAL PROPERTIES Final Report, 1 Oct. 1979 - 30 Sep. 1980

B. P. Curry AEDC Oct. 1981 64 p refs Sponsored by AF
(AD-A106384; AEDC-TR-80-58) Avail: NTIS HC A04/MF A01 CSCL 14/2

The multipole expansion coefficients needed to calculate transient electromagnetic fields and cavity frequency response in an internally excited, damped cavity are derived for an arbitrary but centralized distribution of source currents and an arbitrary number of dampers which have finite width. A block matrix procedure is devised to solve the N damper boundary value problems, but specific solutions are presented for the cases of zero, one, and two dampers. Also, the TM wave multipole coefficients for an uncapped biconical antenna used as excitation source are obtained in closed form, with use of Schelkunoff's mode solution for the antenna currents. Finally, coupled integrodifferential equations for the current distribution in the end caps and the conical sections of a capped bicone source are presented. This entire theory will be encoded to permit analysis of AEDC experiments. Author (GRA)

N82-16330# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

VOICE FLOW CONTROL IN INTEGRATED PACKET NETWORKS M.S. Thesis

Howard Paul Hayden Oct. 1981 165 p refs
(Contract N00014-75-C-1183; ARPA Order 3045)
(AD-A106722; LIDS-TH-1152) Avail: NTIS HC A08/MF A01 CSCL 17/2

Packet-switched networks are used primarily to handle data traffic, but considerable interest has recently been generated in extending packet-switching methods to also handle digitized voice traffic. New network control procedures are needed to deal with packetized voice traffic, as its characteristics are different from regular data traffic. We present two flow control algorithms which can be executed in a distributed manner to adjust source rates according to prevailing network conditions. Although the algorithms were developed for packet-voice networks, they are quite general and are applicable to many other systems. One algorithm is based on an optimization theoretic formulation of the flow control problem. The other has as its major premise a specific notion of fairness. Convergence is shown for both algorithms under static conditions. A program is developed which simulates the behavior of a general packet-switched network on an individual packet basis. It is used to examine the performance of the second flow control algorithm under realistic conditions. Author (GRA)

N82-16331# Mitre Corp., Bedford, Mass.

COHERENT SCATTER OF MICROWAVES FROM MODERATELY ROUGH SURFACES

M. M. Weiner and G. A. Robertshaw Aug. 1981 33 p refs
(Contract F19628-81-C-0001; AF Proj. 4290)
(AD-A106133; MTR-8299) Avail: NTIS HC A03/MF A01 CSCL 20/14

An improved model is reported for the effect of surface roughness on coherent scatter of microwaves from moderately rough terrain and sea surfaces. This model gives agreement with microwave and acoustical experimental data for surface height standard deviations as much as 400% larger than for a widely accepted model discussed by Beckmann and other investigators. The improved agreement with data is achieved by assuming a symmetrical exponential probability density of the surface height random variable. This model lends itself to an interesting physical interpretation of the stochastic process associated with the surface profile. Author (GRA)

N82-16332# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

ANTENNA CONSIDERATIONS AND SIGNAL PROCESSING TECHNIQUES FOR THE IDENTIFICATION OF BURIED NON-METALLIC OBJECTS Final Report

W. J. Steinway and J. A. Fuller Jun. 1981 112 p refs
(Contract DAAK70-78-C-0081)
(AD-A107752) Avail: NTIS HC A06/MF A01 CSCL 19/1

The U. S. Army Mobility Equipment Research and Development Command (MERADCOM) has been involved in a program for the development of an off-road mine detection system. In 1978, the Georgia Institute of Technology Engineering Experiment Station (GIT/EES) began a 36 month contract to gather and analyze radar data and investigate antenna designs with the goal of improving the ability to detect, discriminate and classify buried targets. The project included tasks of initial data analysis, antenna design and fabrication, extensive data collection, and algorithm development. Section 2 describes the data collection methods used with both the NBS measurement equipment and the MERADCOM short-pulse radar and a preliminary analysis of the data. Section 3 deals with the survey of candidate antennas, the design and fabrication of the 'best' choices, and the testing of those antennas. Test results for a cavity-backed spiral, and a broadband horn are presented and compared with a dipole antenna. Section 4 develops the discrimination concept using frequency spectra data and spartial correlation. Both FFT and MEM were used to obtain spectral data for comparison. The results of the discrimination algorithms are given. GRA

N82-16333# Nebraska Univ., Lincoln. Dept. of Electrical Engineering.

FULL WAVE ANALYSIS FOR SCATTERING CROSS SECTIONS Interim Report

Ezekiel Bahar Griffiss AFB, New York RADC Aug. 1981 51 p refs
(Contract F19628-81-K-0025; AF Proj. 2305)
(AD-A107704; RADC-TR-81-204) Avail: NTIS HC A04/MF A01 CSCL 20/14

Part 1: Scattering Cross Sections for Random Rough Surfaces - Full Wave Analysis. The full wave approach developed earlier to evaluate the radiation fields scattered by deterministic two dimensionally rough surfaces is used to determine the scattering cross sections for random rough surfaces. The medium below the irregular boundary is characterized by complex permittivity and permeability. For slightly rough surfaces, the full wave solutions for the incoherent scattered fields are shown to be in agreement with the perturbation solution. However, when the major contributions to the scattered fields come from the region of the rough surface around the stationary phase (specular) points, the full wave solutions are in agreement with the physical optics solutions. Thus, the full wave solutions which reduce the perturbation, the physical optics and the geometrical optics approximations in special cases, precisely determine the limitations of these approximations and reconcile the differences between them. Part 2: Scattering Cross Sections for Composite Random Surfaces - Full Wave Analysis. The full wave approach to rough

surface scattering is applied to composite models of rough surfaces. In this work the principal distinguishing features of the individual rough surface is its correlation distance. Thus this model can be applied to scattering by rough seas as well as hilly terrain. GRA

N82-16334# University of South Florida, Tampa. Dept. of Physics.

COMSTAR SATELLITE 19/29 GHz PROPAGATION EXPERIMENT Final Report, 1977 - 1981

S. C. Bloch, D. Davidson, and D. D. Tang Aug. 1981 110 p refs Prepared in cooperation with GTE Labs., Inc., Waltham, Mass.

(Grant DAAG29-77-G-0224)

(AD-A108001; USF-PPL-45; ARO-15012.3-GS) Avail: NTIS HC A06/MF A01 CSCL 20/14

Results and analysis are presented for the 19/29-GHz satellite propagation experiments using beacons aboard the COMSTAR series. Emphasis is on diversity performance of the Tampa, Florida, Triad and single-site attenuation distributions in intense rain, and on single-site performance at Waltham, Massachusetts. The substantial data base evolved to show a flattish tail on distributions due to rapid rate-of-change at onset and recovery; this type of distribution found in Tampa rain environment was not found in Waltham. Author (GRA)

N82-16335# IIT Research Inst., Annapolis, Md.

A MODEL TO CALCULATE EM FIELDS IN TROPOSPHERIC DUCT ENVIRONMENTS AT FREQUENCIES THROUGH SHF Final Report

Sherman Marcus and William D. Stuart Sep. 1981 236 p refs

(Contract F19628-80-C-0042)

(AD-A107710; ESD-TR-81-102) Avail: NTIS HC A11/MF A01 CSCL 20/14

Non-monotonic variations of the atmospheric refractivity with height often enable energy to be propagated in a duct mode with little attenuation over long distances. A duct model employing a waveguide-mode method of analysis was developed to calculate the field strength when the refractivity variation with height, is known. The developed numerical procedure methodically determines all significant eigenmodes for elevated and surface ducts at all frequencies through SHF. Computer model results for beyond-the-horizon ducts compare favorably with measurements taken at frequencies between 65 MHz and 3.3 GHz.GRA

N82-16336# Kathrein-Werke K.G., Rosenheim (West Germany).

METHOD TO TREAT PICTURE AND SOUND CARRIERS TO OBTAIN A CONSTANT AND ADJUSTABLE LEVEL SPACING BETWEEN THE PICTURE CARRIER AND THE SECOND CARRIER OF A TV SIGNAL WHEN THERE ARE VARIATIONS OF FIELD INTENSITY BETWEEN THE CARRIERS Final Report, Jan. 1980

Hans Hodapp and Peter Maier Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 80 p ref In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-041; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,60

A procedure was investigated, allowing correction of the relation between the television (TV) picture carrier and the sound carrier of the IF range amplifier, realized with relatively small changes of the circuitry. The principle is based on adding to or substracting from the original sound carrier of the IF main signal the selected and treated sound carrier obtained via a bypass. The range of variation of the sound carrier level is + or - 12 db when compared with the picture carrier level. Errors of the amplitude and the group delay occuring in the video frequency part of the TV signal remain within the permissable tolerance of the standard specifications. Measurements of the AF signals show that harmonic distortions are 1%. Installations into the cable TV head-end unit prove its conformity to practical utilization. Author (ESA)

N82-16337# Middleton (David), New York.

PERFORMANCE OF TELECOMMUNICATIONS SYSTEMS IN THE SPECTRAL-USE ENVIRONMENT. 6: ANALYTICAL RESULTS FOR LAND-MOBILE SCENARIOS IN CLASS B INTERFERENCE, WITH FADING AND MULTIPATH

David Middleton Jun. 1981 50 p refs

(Contract HO-A01-78-00-1158)

(PB81-249344; NTIA-CR-81-12) Avail: NTIS HC A03/MF A01 CSCL 17B

A canonical model of receiver performance for land-mobile systems is constructed, for Class B interference environments. The measure of performance is the probability of noninterference criterion (PNIC) Pa, with the desired signal (to the desired receiver) propagating according to a r to the minus 2 gamma power law, where the signal source (or intended receiver) performs a random walk vis-a-vis receiver (or source). Analytical evaluation of the PNIC is carried out, in terms of appropriately defined input signal-to-receiver noise ratios, for Class B EMI environments, which describe the correspondingly different nongaussian noise fields, including random walks with variances, and signals obeying general propagation and fading laws. Author

N82-16338# Middleton (David), New York.

SOME CANONICAL APPROACHES TO THE EVALUATION OF TELECOMMUNICATION SYSTEM PERFORMANCE

David Middleton Jun. 1981 37 p refs

(Contract HO-A01-78-00-1158)

(PB81-249310; NTIA-CR-81-11) Avail: NTIS HC A03/MF A01 CSCL 17B

Canonical approaches for determining optimum receiver structure and performance in a variety of telecommunication applications are described. In particular, one aim of the present effort is to extend the more limited techniques of system evaluation based on signal-to-noise ratios, or on the probability of non-interference criterion, to the general decision-theoretic methods where the error probabilities (or probabilities of correct decisions) are used to contruct more realistic and complete measures of performance, and to obtain optimal systems as well. This is not generally possible at all input signal levels, but a canonical threshold, or weak-signal, theory is, which can be exploited to establish limiting bounds on performance, system comparisons, and structure insights into the required processing algorithms. Author

N82-16339# Academy for Educational Development, Inc., Washington, D. C. Rural Satellite Program.

SATELLITE OPTIONS FOR RURAL TELECOMMUNICATIONS IN DEVELOPING COUNTRIES

Jun. 1981 182 p

(Contract AID-DSPE/C-0081)

(PB81-244766; AED/RSP-81/01; Policy-Study-1) Avail: NTIS HC A09/MF A01 CSCL 17B

Present and planned communication satellite systems with service available for developing countries are described. For each system there is a summary of background information, a chart of technical characteristics and footprint maps (where available) of each satellite's coverage. Trends in Earth station costs and satellite lease charges are discussed. Author

N82-16110*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN FM/CW METHOD FOR THE MEASUREMENTS OF TIME DELAYS OF LARGE CASSEGRAIN ANTENNAS

T. Y. Otoshi *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 49-59 refs (For primary document see N82-15101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20N

N82-16112*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THERMAL MEASUREMENT TECHNIQUE OF RIB ELEMENTS ON DSN ANTENNA STRUCTURE

S.Glazer and G.Gale *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 67-79 refs (For primary document see N82-16101 07-12)

Avail: NTIS HC A16/MF A01 CSCL 20N

N82-16114*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DESIGN OF A 1.5-m, 32-GHz, CLEAR APERTURE ANTENNA

A. Cha *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 87-93 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09C

N82-16120*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED CARRIER TRACKING PERFORMANCE WITH COUPLED PHASE-LOCKED LOOPS
D. Divsalar and J. H. Yuen (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 148-171 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 17B

N82-16122*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GAIN UNCERTAINTY OF ARRAYED ANTENNAS
B. L. Seidel *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 186-190 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

N82-16124*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SINE WAVE RANGING REVISITED
A. I. Zygielbaum and A. Robinson *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 202-210 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

N82-16125*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIO FREQUENCY INTERFERENCE BY EARTH ORBITING SATELLITES: DEEP SPACE INTERFERENCE PREDICTION PROGRAM
D. L. Cain and P. E. Beyer *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 211-213 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

N82-16127*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF PARTIAL COHERENCE IN RECEIVING SYSTEM NOISE TEMPERATURE ON ARRAY GAIN FOR TELEMETRY AND RADIO FREQUENCY CARRIER RECEPTION FOR SIMILAR RECEIVING SYSTEMS
M. H. Brockman *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 219-235 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 17B

N82-16137*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GOLDSTONE STDN 9-METER RADIATION TEST
J. R. Blain *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 341-351 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20N

N82-17070*# Alabama Univ. in Huntsville. Dept. of Physics.
A NEW SPS ANTENNA DESIGN TO REDUCE GRATING LOBES
C. H. Chan *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 14 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20N

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-16340* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE SWITCHING POWER DIVIDER Patent
Ronald J. Stockton and Russell W. Johnson, inventors (to NASA) Issued 24 Nov. 1981 11 p Filed 12 Mar. 1980 Supersedes N80-21670 (18 - 12, p 1572) Sponsored by NASA
(NASA-Case-GSC-12420-1; US-Patent-4,302,734; US-Patent-Appl-SN-129793; US-Patent-Class-333-104; US-Patent-Class-333-246) Avail: US Patent and Trademark Office CSCL 09C

A pair of parallel, spaced-apart circular ground planes define a microwave cavity with multi-port microwave power distributing switching circuitry formed on opposite sides of a thin circular dielectric substrate disposed between the ground planes. The power distributing circuitry includes a conductive disk located at the center of the substrate and connected to a source of microwave energy. A high speed, low insertion loss switching diode and a dc blocking capacitor are connected in series between the outer end of a transmission line and an output port. A high impedance, microwave blocking dc bias choke is connected between each switching diode and a source of switching current. The switching source forward biases the diodes to couple microwave energy from the conductive disk to selected output ports and, to associated antenna elements connected to the output ports to form a synthesized antenna pattern.

Official Gazette of the U.S. Patent and Trademark Office

N82-16341*# Tuskegee Inst., Ala. School of Engineering.
A TEST AND INSTRUMENTATION SYSTEM FOR THE INVESTIGATION OF DEGRADATION OF ELECTRICAL INSULATING MATERIALS
Jan. 1982 55 p refs
(Grant NAG8-005)
(NASA-CR-165109) Avail: NTIS HC A04/MF A01 CSCL 09C

The basic test methods of aging and deterioration mechanisms of electrical insulating materials are discussed. A comprehensive test system developed to study the degradation process is described. This system is completely checked, and calibrated with a few insulating material samples. S.L.

N82-16342*# National Aeronautics and Space Administration, Washington, D. C.
GUNN DIODES AND DEVICES (BIBLIOGRAPHY FOR 1978-1980)
Ye. G. Yelenskiy, A. S. Kosov, and I. A. Strukov Oct. 1981 47 p refs Transl. into ENGLISH of "Diody Ganna i Ustroystva na Ikh Osnove, (bibliografiya za 1978-1980 gg)", Acad. of Sci. USSR, Rept. Pr-614, 1980 p 1-57 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Inst. of Space Research
(Contract NASw-3541)
(NASA-TM-76750) Avail: NTIS HC A03/MF A01 CSCL 09A

A listing of about 500 works from Soviet and foreign scientific literature on Gunn diodes and devices based on them is presented. The bibliography includes publications in which various questions pertinent to all (or several) types of semiconductor instruments in the superhigh frequency range are mentioned. A subject index is included. J.D.H.

N82-16343*# Boeing Aerospace Co., Kent, Wash.
ANALYSIS OF FIELD USAGE FAILURE RATE DATA FOR PLASTIC ENCAPSULATED SOLID STATE DEVICES Final Report
23 Dec. 1981 257 p refs
(Contract NAS8-33079)
(NASA-CR-161946; D180-25325-1) Avail: NTIS HC A12/MF A01 CSCL 09A

Survey and questionnaire techniques were used to gather data from users and manufacturers on the failure rates in the field of plastic encapsulated semiconductors. It was found that such solid state devices are being successfully used by commercial companies which impose certain screening and qualification procedures. The reliability of these semiconductors is now adequate to support their consideration in NASA systems, particularly in low cost systems. The cost of performing necessary screening for NASA applications was assessed. A.R.H.

N82-16344*# Boeing Aerospace Co., Seattle, Wash. Engineering Technology Div.
DEVELOPMENT OF DESIGN, QUALIFICATION, SCREENING, AND APPLICATION REQUIREMENTS FOR PLASTIC ENCAPSULATED SOLID-STATE DEVICES FOR SPACE APPLICATIONS Final Report
23 Dec. 1981 198 p refs
(Contract NAS8-33079)
(NASA-CR-161947; D180-26784-1) Avail: NTIS
HC A09/MF A01 CSCL 09A

Test data were collected on 1035 plastic encapsulated devices and 75 hermetically sealed control group devices that were purchased from each of five different manufacturers in the categories of (1) low power Schottsky TTL (bipolar) digital circuits; (2) CMOS digital circuits; (3) operational amplifier linear circuits; and (4) NPN transistors. These parts were subjected to three different initial screening conditions, then to extended life testing, to determine any possible advantages or trends for any particular screen. Several tests were carried out in the areas of flammability testing, humidity testing, high pressure steam (auroclave) testing, and high temperature storage testing. Test results are presented. Procurement and application considerations for use of plastic encapsulated semiconductors are presented and a statistical analysis program written to study the log normal distributions resulting from life testing is concluded. A.R.H.

N82-16345# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) SPECIFICATION FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Feb. - 31 Mar. 1981
Fred M. Bruno 30 Apr. 1981 19 p
(Contract DAAK70-80-C-0168)
(AD-A106433; TEI-A009-2; QR-2) Avail: NTIS
HC A02/MF A01 CSCL 19/1

The 1st submission of one (1) Phase I - Engineering Sample is ready for shipment to the contractor's representative. Test Data Forms contain results obtained by TEI's Engineering and Quality Assurance Departments during inspection and testing.
Author (GRA)

N82-16346# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, Oct. 1980 - Jan. 1981
Fred M. Bruno 10 Feb. 1981 14 p
(Contract DAAK70-80-C-0168)
(AD-A106432; TEI-A009-1; QR-1) Avail: NTIS
HC A02/MF A01 CSCL 19/1

An alternate design was proposed for the neck shield. This design encapsulates the anode lead within the shield in order to decrease the possibility of damage due to handling and installation. Materials have been received, inspected, and are available for fabrication and test of the first engineering sample during the next quarter - 1 February 1981 through 30 April 1981. Author (GRA)

N82-16347# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
NOVEL DIGITAL SIGNAL PROCESSING AND DETECTION TECHNIQUES Final Report, 1 Sep. 1976 - 30 Aug. 1981
Bede Liu 30 Sep. 1981 17 p
(Grant AF-AFOSR-3083-81; AF Proj. 2304)
(AD-A106774; AFOSR-81-0714TR) Avail: NTIS
HC A02/MF A01 CSCL 09/3

In the area of narrowband signal processing, design rules are developed for optimum decimator and interpolator, a new efficient scheme using recursive filter for decimation/interpolation is proposed, and a novel approach to the computation of narrowband spectra is shown to yield substantial saving over conventional approaches. Results on the implementation of recursive filters with poles near the unit circle that produces significantly reduced roundoff error include a transformation technique, a scheme to modify the quantizer error spectrum, and a new computationally efficient low noise filter structure. In the area of nonclassical signal detection, several results were derived on nonparametric sequential procedures and on the quantization of signal for detection. In addition, a programmable charge transfer device filter is developed, several problems concerning ADPCM are investigated, results are obtained on FFT roundoff error including the prime factor algorithm, and an effective method of generating random sequences is studied. GRA

N82-16348# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1981
Alan J. McLaughlin and Alan L. McWhorter 15 May 1981 22 p ref
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A106671; ESD-TR-81-92) Avail: NTIS
HC A02/MF A01 CSCL 09/3

The complementary metal oxide semiconductor process was debugged, and 4 bit counters were built and successfully tested. A restructurable VLSI demonstration wafer which uses that counter is in process, and cell layouts were finished for two whole wafer RVLSI designs. The laser link insulator was modified to allow higher temperature processing. Thin oxynitride gate transistors showed excellent radiation resistance. Other topics covered include solid state device research, quantum electronics, materials research, microelectronics, and analog device technology. GRA

N82-16349# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CHARACTERIZATION OF POWER MESFETS AT 21 GHz
Mark L. Stevens 15 Sep. 1981 37 p refs
(Contract F19628-80-C-0002)
(AD-A106673; TR-579; ESD-TR-81-191) Avail: NTIS
HC A03/MF A01 CSCL 09/5

This report describes the development of GaAs MESFET power amplifiers at 21 GHz. Techniques for making large-signal loadpull and 'S' parameter measurements at these frequencies, and the measured device characteristics are presented. A unique method of obtaining accurate gain and power measurements is discussed. Design methods and data are presented on 21 GHz amplifiers with more CW power and higher efficiency than previously achieved. Author (GRA)

N82-16350# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
THE COMPLEXITY OF MANIPULATING HIERARCHICALLY DEFINED SETS OF RECTANGLES Interim Report
Jon Louis Bentley and Thomas Ottmann (Karlsruhe Univ.) Apr. 1981 43 p refs
(Contract N00014-76-C-0370)
(AD-A106552; CMU-CS-81-109) Avail: NTIS
HC A03/MF A01 CSCL 09/5

Algorithms that manipulate sets of rectangles are of great practical importance in VLSI design systems and other applications. Although much theoretical work has appeared recently on the complexity of rectangle problems, it has assumed that the inputs are given as a list of rectangles. In this paper we study the complexity of rectangle problems when the inputs are given in a hierarchical language that allows the designer to build large designs by replicating small designs. We will see that while most of the problems are NP-hard in the general case, there are O(N lg N) algorithms that process inputs obeying certain restrictions. Author (GRA)

N82-16351# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EHF TEST-BED SUBHARMONIC MIXER
Maurice J. Aghion 14 Jul. 1981 82 p refs
(Contract F19628-80-C-0002; AF Proj. 2029)
(AD-A106156; TR-567; ESD-TR-81-190) Avail: NTIS
HC A05/MF A01 CSCL 09/5

The development, design and construction of a subharmonically pumped mixer at 44 GHz using GaAs Schottky beam lead diodes is discussed. A simplified theory is used to derive a three-port equivalent circuit of the complete mixer which includes effects such as diode parasitics and filter characteristics. Specific design criteria are developed at each of the three mixer signal frequencies, RF, LO and IF, which relate this equivalent circuit to the observed performance. Author (GRA)

N82-16352# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LSI/VLSI ION IMPLANTED GaAs IC PROCESSING Quarterly Technical Report, 1 Feb. - 30 Apr. 1981
R. Zucca, B. M. Welch, C. P. Lee, Y. D. Shen, P. Asbeck, C. G.

Kirkpatrick, A. Firstenberg, and G. Kaelin Sep. 1981 71 p refs
(Contract F49620-80-C-0101; ARPA Order 3384; AF Proj. 3384)
(AD-A107623; MRDC41070.9QR; AFOSR-81-0745TR; QTR-3) Avail: NTIS HC A04/MF A01 CSCL 09/3

This report covers the third quarter of a program on LSI/VLSI ion implanted planar GaAs integrated circuit processing. The goal of this program is to realize the full potential of GaAs digital integrated circuits employing depletion mode MESFETs by developing the necessary processing methods and material capabilities to extend device complexity to VLSI. In the third quarter the digitization of mask set AR6 was completed. Masks are expected from the vendor shortly. Evaluation of refinements in the fabrication process aimed at improving reliability has continued, while evaluation of circuit reliability has been started. GRA

N82-16353# Stanford Univ., Calif. Lab. of Physics.
REPORT OF SIGNIFICANT ACCOMPLISHMENTS Annual Progress Report, 1 Apr. 1980 - 31 Mar. 1981
A. E. Siegman, B. A. Auld, M. R. Beasley, R. L. Byer, G. S. Kino, and H. J. Shaw Apr. 1981 113 p refs
(Contract N00014-75-C-0632)
(AD-A107607; GL-3315) Avail: NTIS HC A06/MF A01 CSCL 09/5

This report summarizes the research progress and activity on Joint Services Electronics Program for the period 1 April 1980 through 31 March 1981. Specific Projects are: (1) High Tc Superconducting Weak-Link Josephson Junctions and Circuits; (2) Acoustic Surface Wave Scanning of Optical Images; (3) Research on Fiber Optic Interactions with Application to High Speed Signal Processing; (4) Nonlinear Interactions of Acoustic Waves with Domains in Ferroic Materials; (5) Measurements of Ultrafast Physical Phenomena; and (6) Optical and Nonlinear Optical Studies of Single Crystal Fibers. GRA

N82-16354# University of Southern California, Los Angeles. Electronic Sciences Lab.
RESEARCH IN ELECTRONICS: JSEP Final Report, 1 Apr. 1976 - 31 Mar. 1981
Z. A. Kaprielian Mar. 1981 80 p refs
(Contract F44620-76-C-0061; AF Proj. 2305)
(AD-A107624; AFOSR-81-0722TR) Avail: NTIS HC A05/MF A01 CSCL 09/3

This final technical report summarizes accomplishments and progress of 31 work units (project) for research performed during the reporting period under the Joint Services Electronics Program by the USC Electronic Sciences Laboratory. Author (GRA)

N82-16355# Varian Associates, Palo Alto, Calif. Solid State Lab.
RESEARCH ON InGaAs FETs Final Report, May 1978 - Aug. 1981
R. Yeats, K. VonDessonneck, S. Bandy, and Y. G. Chai Sep. 1981 37 p refs
(Contract N00014-78-C-0380; NR Proj. 251-030)
(AD-A108016) Avail: NTIS HC A03/MF A01 CSCL 09/1

A process has been established for fabricating In.53Ga.47As JFETs on InP substrates that is capable of making JFETs with small gate lengths (almost equal to 0.5 micrometer), low source resistance (2 omega), low gate series resistance (2 omega), low gate series resistance (< 4 omega), negligible 'sidewall' capacitance, and low gate leakage current (approximately 100 nA). The process involves a shallow localized Zn diffusion and a controlled etch using the gate metal as a mask. The effective gate length is somewhat smaller than the gate metal 'length', thus facilitating the formation of submicron gates. At modest reverse-bias gate voltages, these JFETs have g sub m values approching twice that which would be expected for corresponding GaAs MESFETs. However, near zero-gate bias, there is substatial g sub m compression, perhaps arising from defects associated with the Zn-diffusion process. Further devise optimization is still required along the lines of increasing channel doping, decreasing gate length, and developing improved diffusion processes [e.g., ion-implantation). Optimized In .53Ga.47As JFETs will probably outperform even the best GaAs MESFETs. GRA

N82-16356# Los Alamos Scientific Lab., N. Mex.
PARTIAL DISCHARGE CHARACTERISTICS OF LIQUID-IMPREGNATED LAMINATE DIELECTRIC STRUCTURES
K. J. Bickford, W. J. Sarjeant, and G. H. Mauldin 1981 9 p refs Presented at IEEE Conf. on Elec. Insulation and Dielec. Phenomena, Pokenose, N.J.
(Contract W-7405-eng-36)
(DE81-028745; LA-UR-81-2119; CONF-811112-11) Avail: NTIS HC A02/MF A01

Foil edge partial discharge phenomena in high energy density, spirally wound capacitors were investigated. A partial discharge dependency on voltage found to exist in liquid impregnated, laminar plastic film dielectric structures. Experiments support the hypothesis that electric charges are injected into the dielectric regions heat the foil edge by field controlled charge objectives during impressed voltage transients. The resulting conduction current space charge can establish equilibrium by reduction of the electric field intensity below the partial discharge inception threshold. A temporal characterization of this space charge injection is discussed relative to the effect on partial discharge inception at the foil edge. DOE

N82-16357# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
MICROCOMPUTER BASED TEST SYSTEM FOR CHARGE COUPLED DEVICES
S. Sidman Feb. 1981 6 p refs Presented at IEEE Conf. on Appl. of Mini and Microcomputers, San Francisco, 9 Nov. 1981
(Contract W-7405-eng-48)
(DE81-029860; LBL-12303) Avail: NTIS HC A02/MF A01

A microcomputer based system for testing analog charge coupled integrated circuits is described. It measures device performance for three parameters, dynamic range, baseline shift due to leakage current, and transfer efficiency. A companion board tester was developed. The software consists of a collection of BASIC and Assembly language routines developed on the test system microcomputer. DOE

N82-16358# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EVALUATION TESTS OF ABACUS 6 kVA UTILITY-INTERACTIVE INVERTER
E. E. Landsman Aug. 1981 19 p
(Contract DE-AC02-76ET-20279)
(DE82-001352; DOE/ET-20279/145) Avail: NTIS HC A02/MF A01

The voltage pattern spectra were analyzed for 100% and 50% pattern ratios and harmonics analyses are provided for the Abacus inverter. The harmonics are compared with those calculated for a simple model with no agreement. AC waveforms and inverter current spectra are given as well as basic electrical data. DOE

N82-16359# Bharat Heavy Electricals Ltd., Bhopal (India).
SEMINAR: ENERGY CONSERVATION. ROLE OF POWER CAPACITORS: CONCEPTS AND POLICY ISSUES
R. K. Pachauri 6 Aug. 1981 44 p refs
(PB81-247967) Avail: NTIS HC A03/MF A01 CSCL 09C

Energy conservation and power capacitors concepts and policy issues energy conservation by application of power capacitors in Indian power system network, the application of dynamic shunt compensation, and the application of series capacitors in distribution circuits are discussed. Author

N82-16360# Mitre Corp., McLean, Va.
A SURVEY OF ELECTRIC PROPULSION MOTORS FOR AUTOMATED GUIDEWAY TRANSIT VEHICLES
Lisandro delCid Jul. 1981 104 p refs
(Contract DTUM60-80-C-71020)
(PB82-109307; MTR-80W274; UMTA-VA-06-0056-81-1) Avail: NTIS HC A06/MF A01 CSCL 13F

An overview of the current status of electric motors with potential applications in automated guideway transit (AGT) systems is presented. Direct current (dc) motors are surveyed, and induction, synchronous, and linear electric motors reviewed. Performance characteristics of typical state of the art dc and induction motors are provided. Current work on improved and advanced designs of rotary and linear motors is also reviewed. It is concluded that performance requirements of existing AGT

concepts can be satisfied with available technology traction motors, conventional dc motors with switched power supplies will continue to be the most widely used motor for traction application, and solid state devices are a major factor in achieving improved motor performance. Author (GRA)

N82-16361# National Bureau of Standards, Washington, D.C. Electron Devices Div.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: THE DESIGN, TESTING, AND ANALYSIS OF A COMPREHENSIVE TEST PATTERN FOR MEASURING CMOS/SOS PROCESS PERFORMANCE AND CONTROL Final Report
Loren W. Linholm Aug. 1981 148 p refs Sponsored in part by Air Force and DNA
(PB81-245342; NBS-SP-400-66; LC-81-600078) Avail: NTIS HC A07/MF A01 CSCL 09E

A Process Validation Wafer (PVW) is a wafer containing only test patterns. One PVW accompanies a product lot during the fabrication process. Test patterns designed to be used on PVWs contain both process parameter test structures and random fault test structures. Eighteen PVWs fabricated in a radiation hardened silicon gate CMOS/SOS process were tested on a high speed computer controlled dc test system. Test results from the process parameter test structures were used to establish the baseline electrical parameters for each product lot and to produce an eight level gray scale wafer map for these parameters. GRA

N82-16119*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A DIGITAL FILTER IMPLEMENTATION OF THE DEEP SPACE TRANSPONDER PHASE LOCK LOOP INTEGRATOR
J. W. Heller *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 138-147 ref (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09C

N82-16133*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPERATIONAL VLBI CLOCK SYNCHRONIZATION AND PLATFORM PARAMETER DETERMINATION
J. V. LuValle, R. D. Shaffer, M. G. Roth, T. M. Eubanks, and P. S. Callahan *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 307-318 ref (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09C

N82-16134*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SYNTHESIZER STABILITY EVALUATION
E. N. Sosa and D. A. Tyner *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 319-330 ref (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09C

N82-16135*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVESTIGATION OF DIGITALLY CONTROLLED OSCILLATOR OPERABILITY PROBLEMS
W. D. Weisman *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 331-334 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09A

N82-17052*# Fort Valley State Coll., Ga. Dept. of Electronic Engineering Technology.
DETECTION AND ANALYSIS OF RADIO FREQUENCY LIGHTNING EMISSIONS
Fereydoun Jalali *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09C

N82-17059*# South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
THE DESIGN AND EVALUATION OF SUPERCONDUCTING CONNECTORS
James E. Payne *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 10 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09A

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-16362# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CALCULATION OF THE TEMPERATURE OF A PERMANENT INCOMPRESSIBLE LAMINAR FLOW IN A TUBE WITH KNOWN WALL TEMPERATURE DISTRIBUTION M.S. Thesis [CALCULO DE TEMPERATURA EM UM ESCOAMENTO LAMINAR INCOMPRESSIVEL PERMANENTE EM UM TUBO COM DISTRIBUICAO DE TEMPERATURA CONHECIDA NA PAREDE]
Jeronimo dos Santos Travelho Jul. 1981 47 p refs In PORTUGUESE; ENGLISH abstract
(INPE-2153-TDL/057) Avail: NTIS HC A03/MF A01

The solution of the energy equation for an incompressible fluid that flows through a pipe of circular section is obtained. The effects of axial conduction and viscosity are considered. It is shown that this solution should be applied to problems with first, second and third kind boundary conditions. An example is solved using boundary conditions of the first kind. Author

N82-16363*# Old Dominion Univ., Norfolk, Va. School of Sciences and Health Professions.
A MODIFIED DODGE ALGORITHM FOR THE PARABOLIZED NAVIER-STOKES EQUATION AND COMPRESSIBLE DUCT FLOWS Final Report, 15 Apr. 1978 - 30 Nov. 1981
C. H. Cooke Dec. 1981 34 p refs
(Grant NsG-1517)
(NASA-CR-165080) Avail: NTIS HC A03/MF A01 CSCL 20D

A revised version of Dodge's split-velocity method for numerical calculation of compressible duct flow was developed. The revision incorporates balancing of mass flow rates on each marching step in order to maintain front-to-back continuity during the calculation. The (checkerboard) zebra algorithm is applied to solution of the three dimensional continuity equation in conservative form. A second-order A-stable linear multistep method is employed in effecting a marching solution of the parabolized momentum equations. A checkerboard iteration is used to solve the resulting implicit nonlinear systems of finite-difference equations which govern stepwise transition. Qualitive agreement with analytical predictions and experimental results was obtained for some flows with well-known solutions. Author

N82-16364*# Cooper Union, New York.
A COMPREHENSIVE MODEL TO DETERMINE THE EFFECTS OF TEMPERATURE AND SPECIES FLUCTUATIONS ON REACTION RATES IN TURBULENT REACTING FLOWS Semiannual Status Report, 1 Aug. 1981 - 31 Jan. 1982
E. Foy, G. Ronan, and W. Chinitz 31 Jan. 1982 77 p refs (Grant NAG1-18)
(NASA-CR-165108) Avail: NTIS HC A05/MF A01 CSCL 20D

A principal element to be derived from modeling turbulent reacting flows is an expression for the reaction rates of the various species involved in any particular combustion process under consideration. A temperature-derived most-likely probability density function (pdf) was used to describe the effects of temperature fluctuations on the Arrhenius reaction rate constant. A most-likely bivariate pdf described the effects of temperature and species concentrations fluctuations on the reaction rate. A criterion is developed for the use of an 'appropriate' temperature pdf. The formulation of models to calculate the mean turbulent Arrhenius reaction rate constant and the mean turbulent

reaction rate is considered and the results of calculations using these models are presented. A.R.H.

N82-16365# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
CRITICAL PARAMETERS FOR DETONATION PROPAGATION AND INITIATION OF SOLID EXPLOSIVES
Donna Price 10 Sep. 1981 105 p refs
(AD-A106485; NSWC/TR-80-339) Avail: NTIS HC A06/MF A01 CSCL 19/1

The complicated relations and interdependence of the various critical parameters are demonstrated. In particular, the critical diameter is determined by charge temperature, initial particle size, density, confinement, composition, and shock sensitivity. The critical initiating pressure is also a multivariant function and depends on the same set of variables. Relations between different gap (shock sensitivity) test results and between those of gap and wedge tests are also shown. Author (GRA)

N82-16366# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
USE OF THE PITOT TUBE IN VERY LOW DENSITY FLOWS Final Report, Feb. 1964 - Jan. 1981
W. B. Stephenson AEDC Oct. 1981 34 p refs Sponsored by AF
(AD-A106374; AEDC-TR-81-11) Avail: NTIS HC A03/MF A01 CSCL 14/2

The cryogenically pumped vacuum chamber has made it possible to generate gas dynamic flows of much lower density than conventional wind tunnels. In the process of calibrating these flows since 1964, pitot tube data have been obtained in a regime that corresponds to very high altitude flight, low Reynolds numbers (< 100/cm), or high Knudsen numbers (mean-free-path > 40X pitot diameter). Under these conditions, pitot pressures may be four times the inviscid stagnation pressure. Therefore, a substantial correction must be applied to the measured pitot tube data to use it for gas stream calibrations. The available pitot data are correlated in concise form with Reynolds number evaluated behind a normal shock, Re2, and total temperature as a parameter. The physical variables are combined in a form of presentation that permits direct determination of stream properties in nozzle or free-jet expansions without the usual successive approximations. The data are presented in a form that permits selection of pitot tube size, transducer range, and applicability of the instrument in specific flow conditions. The use of the pitot tube to survey the rarefied flow of jet from a rocket motor in a space chamber is discussed. The low density nozzles used in Aerospace Chamber (10V) are probably unique in the low density limit, and the pitot pressure data provide an insight into the gas dynamics of rarefied flows. GRA

N82-16367# New Jersey Inst. of Tech., Newark.
HEAT TRANSFER FROM IMPINGING JETS. A LITERATURE REVIEW Final Report, Sep. 1979 - Nov. 1980
Peter Hrycak Wright-Patterson AFB, Ohio AFWAL Jun. 1981 71 p refs
(Contract F33615-79-C-3417; AF Proj. 2402)
(AD-A106723; AFWAL-TR-81-3054) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report is a literature survey of the state-of-the-art of heat transfer from impinging air jets. Over 70 references are cited. Author (GRA)

N82-16368# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
LASER VELOCIMETER MEASUREMENTS IN TURBULENT AND MIXING FLOWS, PART 3 Final Technical Report, 1 Mar. 1977 - 31 Dec. 1980
Warren H. Stevenson, H. Doyle Thompson, and T. S. Luchik Wright-Patterson, AFB, Ohio AFAPL Jun. 1981 39 p refs (Contract F33615-77-C-2010; AF Proj. 2308)
(AD-A106130; AFAPL-TR-79-2009-Pt-3) Avail: NTIS HC A03/MF A01 CSCL 20/4

Experimental and analytical studies of subsonic flow over a backward facing 2-D step and in a cylindrical simulated dump combustor were conducted. A laser velocimeter was used to obtain mean velocities and turbulence quantities. A method for detecting and eliminating velocity bias errors in such measurements was developed. The 2/E/FIX computer code used for numerical modeling predicted the mean velocity field satisfactorily, but was less effective in computing turbulence quantities. Author (GRA)

N82-16369# General Atomic Co., San Diego, Calif.
FLUID MECHANICS AND HEAT TRANSFER SPIRALLY FLUTED TUBING
J. C. LaRue, P. A. Libby, and J. S. Yampolsky Aug. 1981 57 p refs
(Contract N00014-79-C-0773)
(AD-A107983; GA-A-16541) Avail: NTIS HC A04/MF A01 CSCL 20/4

The objective of this program is to develop both a qualitative and a quantitative understanding of the fluid mechanics and heat transfer mechanisms that underlie the measured performance of the spirally fluted tubes under development at General Atomic. The reason for the interest in the spirally fluted tubes is that results to date have indicated three advantages to this tubing concept: The fabrication technique of rolling flutes on strip and subsequently spiralling and simultaneously welding the strip to form tubing results in low fabrication costs, approximately equal to those of commercially welded tubing. The heat transfer coefficient is increased without a concomitant increase of the friction coefficient on the inside of the tube. In single-phase axial flow of water, the helical flutes continuously induce rotation of the flow both within and without the tube as a result of the effect of curvature. An increase in condensation heat transfer on the outside of the tube is achieved. In a vertical orientation with fluid condensing on the outside of the helically fluted tube, the flutes provide a channel for draining the condensed fluid. GRA

N82-16370# Naval Surface Weapons Center, Dahlgren, Va. Combat Systems Dept.
FAR FIELD OVERPRESSURE FROM TNT EXPLOSIONS: A SURVEY OF AVAILABLE MODELS Final Report
L. L. Pater Apr. 1981 25 p refs
(AD-A107952; NSWC/TR-81-132) Avail: NTIS HC A03/MF A01 CSCL 19/4

Available mathematical models for peak blast wave overpressure at large distances from TNT explosions were surveyed. Analytical and empirical models are discussed. Author (GRA)

N82-16371# Aeronautical Research Labs., Melbourne (Australia).
A PREDICTION METHOD FOR TURBULENT BOUNDARY LAYERS IN ADVERSE PRESSURE GRADIENTS
W. H. Schofield Feb. 1981 57 p refs
(AD-A107849; ARL/MECH-ENG-NOTE-385) Avail: NTIS HC A04/MF A01 CSCL 20/4

A prediction method for turbulent boundary layers in moderate to strong adverse pressure gradients is presented. The closure hypothesis for the method is the universal velocity defect law of Schofield and Perry (1972) which restricts the method to the prediction of layers in moderate to strong adverse pressure gradient. The method is tested against nine experimentally measured boundary layers. Predictions for velocity profile shape, boundary layer thicknesses and velocity scale ratio were generally in good agreement with the experimental measurements and were superior to those given by other prediction methods. Unlike other methods the present method also gives reasonably accurate predictions for the shear stress profile of a layer. The analysis presented is compared with previous work and helps to resolve some disagreements discerned in the literature. GRA

N82-16372# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN EXPERIMENTAL STUDY OF FORCED ASYMMETRIC OSCILLATIONS IN A ROTATING LIQUID-FILLED CYLINDER Final Report
Richard D. Whiting Oct. 1981 85 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A107948; ARBRL-TR-02376) Avail: NTIS HC A05/MF A01 CSCL 20/4

An experimental study was made of forced asymmetric oscillations in a liquid-filled, rapidly-rotating, right circular cylinder. Oscillations were forced by causing the cylinder to cone about an axis passing through the center of the cylinder but offset by

a small angle from the axis of rotation; the motion is similar to precession of a gyrostat but constrained to fixed frequency and amplitude. The fluctuating pressure response of the liquid in the cylinder was measured using pressure transducers mounted in an end wall. Fluctuating pressure was measured for non-dimensional coning frequencies of .030 to .075, for coning angles of .00018 x .035 radians, and for Reynolds numbers of 5,000 to 500,000. Comparisons were made to existing linear theories of the liquid response. The results agreed with theoretical predictions at the highest Reynolds number, and smallest angles. At the smallest Reynolds number, the data agreed better with the solution of a forced oscillation problem than with the solution of a free oscillation problem. At coning angles as small as .0005, the data showed significant departure from the predictions of linear theory, and at coning angles as small as .0008, the liquid exhibited nonstationary behavior suggestive of a flow instability. GRA

N82-16373# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.

SIMPLE COMPUTER PROGRAM TO MODEL 3-DIMENSIONAL UNDERGROUND HEAT FLOW WITH REALISTIC BOUNDARY CONDITIONS

P. D. Metz 1981 13 p refs Presented at the Am. Soc. of Mech. Engrs. Winter Ann. Meeting ASME Solar Energy Div., Washington, D.C., 15-20 Nov. 1981

(Contract DE-AC02-76CH-00016)

(DE81-030213; BNL-29776; CONF-811101-11) Avail: NTIS HC A02/MF A01

A FORTRAN computer program called GROCS (GRound Coupled Systems) has been developed to study 3-dimensional underground heat flow. Features include the use of up to 30 finite elements or blocks of Earth which interact via finite difference heat flow equations and a subprogram which sets realistic time and depth dependent boundary conditions. No explicit consideration of mositure movement or freezing is given. GROCS has been used to model the thermal behavior of buried solar heat storage tanks (with and without insulation) and serpentine pipe fields for solar heat pump space conditioning systems. The program is available independently or in a form compatible with specially written TRNSYS component TYPE subroutines. The approach taken in the design of GROCS, the mathematics contained and the program architecture, are described. Then, the operation of the stand-alone version is explained. Finally, the validity of GROCS is discussed. DOE

N82-16374# Washington State Univ., Pullman. Dept. of Mechanical Engineering.

STUDY OF NON-DARCY NATURAL CONVECTION FROM A VERTICAL HEATED SURFACE IN A SATURATED POROUS MEDIUM

J. C. Huenefeld and O. A. Plumb 1981 8 p ref Presented at the 20th Natl. Heat Transfer Conference, Milwaukee, 2 Aug. 1981; sponsored by ASME

(Contract DE-AC06-76RL-01830-; Grant NSF ENG-78-20145)

(DE81-030081; PNL-SA-9712; CONF-810804-17; Rept-81-HT-45) Avail: NTIS HC A02/MF A01

Experimental investigation of the buoyancy induced boundary layer adjacent to a vertical uniformly heated foil imbedded in a saturated porous medium is described. Temperature profiles were measured for Rayleigh numbers ranging from 136 to 4640 corresponding to Reynolds numbers based on the particle diameter of from 0.85 to 10.5. For Reynolds numbers in excess of 3, the temperature profiles exhibit spatial and temporal fluctuations. The discrepancy in heat transfer is in part attributed to non-Darcy effects. The effect of the permeability increase at the wall/porous medium interface is qualitatively examined for different size particles. The results indicate that the wall effect is a strong function of particle diameter. DOE

N82-16375# California Univ., Livermore. Lawrence Livermore Lab.

EFFECTS OF GAS-FLOW PATTERN ON CAVITY SHAPE

John R. Creighton 22 Jul. 1981 16 p refs Presented at the 7th Ann. Underground Coal Conversion Symp., Fallen Leaf Lake, Calif., 7-11 Sep. 1981

(Contract W-7405-eng-48)

(DE82-000347; UCRL-85907; CONF-810923-10) Avail: NTIS HC A02/MF A01

The effects of different gas flow patterns on the cavity shape in laboratory scale coal block experiments are shown. The burning of pure carbon is modeled. The rate of removal of carbon from the cavity wall is shown to depend on the local rate of oxygen transport to the wall. A numerical model which assumes plug flow in the cavity with a laminar boundary layer gives cavities shaped like an exponential horn, with the largest radius next to the inlet. The downstream shape is in reasonable agreement with experiment. When cavity flow is calculated using the full Navier-Stokes equations the flow near the inlet resembles an expanding jet surrounded by a torroidal vortex. The maximum rate of oxygen transport to the wall occurs where the jet strikes the converging cavity wall some distance downstream. The reduced oxygen transport near the inlet causes the upstream portion of the cavity to be rounded. The downstream portion of the cavity is similar to that with plug flow. DOE

N82-17079*# Alabama Univ. in Huntsville. Dept. of Mechanical Engineering.

HEAT LOSS AND DRAG OF SPHERICAL DROP TUBE SAMPLES

Donald B. Wallace *In its* the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 31 p refs (For primary document see N82-17043 07-99)

Avail: NTIS HC A25/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-16376# Pennsylvania State Univ., University Park. Applied Research Lab.

THE ARL/FED ANECHOIC CHAMBER

R. C. Marboe and J. M. Fitzgerald 4 Aug. 1981 32 p refs (Contract N00024-81-C-6043)

(AD-A106352; ARL/PSU-TM-81-164) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report documents the design and acoustic characteristics of the Applied Research Laboratory Department anechoic chamber. It is located on the above-console deck of the Garfield Thomas Water Tunnel situated so as to allow its use in conjunction with the Axial Flow Research Fan (AFRF). The internal free dimensions of the chamber are 2.74 x 3.05 x 1.98 meters (9 x 10 x 6.5 ft.). The sound absorbing walls are composed of polyurethane foam acoustic wedges, air voids, embossed acoustic foam wall lining, plywood and wood frame members. Air intake ducts, baffled and lined with a lead-foam sheet, provide an adequate air volume for the AFRF. Based on measurements of transmission loss and inverse square law, the chamber is considered anechoic for frequencies above 230 Hz and semi-anechoic for lower frequencies. GRA

N82-16377# Honeywell Systems and Research Center, Minneapolis, Minn.

DUAL POLARIZATION FIBER OPTIC GYRO Final Report, 1 Oct. 1980 - 30 Sep. 1981

Joel G. Hanse, Robert B. Smith, and Gordon L. Mitchell 30 Oct. 1981 91 p refs

(Contract N00173-80-C-0344)

(AD-A106731; HONEYWELL-81SRC75) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report presents results from a Naval Research Laboratory-sponsored investigation of dual polarization gyros. The dual polarization concept is a new fiber optic gyro configuration designed to provide independence from principal gyro bias error sources. Experimental results indicate an order of magnitude improvement in bias error performance. Important results from a new modeling capability are also included. In addition to examination of dual polarization gyro performance, a number of

fiber gyro configurations have been examined. Results of this effort include development of an improved understanding of fiber optic depolarizers and identification of a previously unreported error team for gyros using 3 dB distributed couplers.
Author (GRA)

N82-16378# TRW Defense and Space Systems Group, Redondo Beach, Calif.
THE 403 MHz SAW OSCILLATOR Final Report
D. J. Dodson Fort Monmouth, N.J. ERADCOM Nov. 1981 83 p
(Contract DAAK20-80-C-0260)
(AD-A107588; DELET-TR-80-0260-F) Avail: NTIS HC A05/MF A01 CSCL 09/5

This contract provides for a sixteen month program for the investigation and exploratory development of a 200 mW, SAW stabilized oscillator which can be frequency and amplitude modulated. The oscillator is to have its center frequency at 403 MHz and be tunable over a + or - 3MHz bandwidth. Trade-off design studies have been performed to determine techniques which will provide the most effective interaction of essential oscillator components, i.e., SAW delay-line, phase shifter, coupler and amplifier, to provide a high degree of frequency stability. A significant effort was made to implement the required circuit functions in a low-cost printed circuit approach rather than utilize high-cost commercially available components, since the oscillator is intended for use in an expendable application. Author (GRA)

N82-16379# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
THEORY OF A MODIFIED WADSWORTH MONOCHROMATOR MATCHED TO A LOW ENERGY STORAGE RING SOURCE
Malcolm R. Howells 1981 21 p refs Presented at the 2nd Natl. Conf. on Synchrotron Radiation Instrumentation, Ithaca, N.Y., 15 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE81-030034; BNL-29838; CONF-810750-3) Avail: NTIS HC A02/MF A01

The concave diffraction grating in the Wadsworth mounting has been popular with synchrotron radiation spectroscopists because of its use of parallel light. This is well matched to experimental stations which are a great distance away from the source as would be the case in using a high energy synchrotron. For low energy storage rings the working distance is quite small and in this case it is appropriate to use a collimating mirror. Large collection angles are possible with this arrangement and reasonable resolution can be obtained using spherical surfaces. Astigmatism is much lower than for Rowland circle mountings. These questions are analyzed using an optical path function development and calculations are presented which include the aberrations both in the two optics and those caused by the large extension of the source in the direction of the radiation emission. DOE

N82-16380# Washington State Univ., Pullman. Dept. of Mechanical Engineering.
VENTURI DESIGN FOR METERING SOLIDS FLOW IN GAS-SOLIDS SUSPENSIONS Semiannual Progress Report
C. T. Crowe 31 Sep. 1981 30 p
(Contract DE-FG22-80PC-30212)
(DE81-031944; DOE/PC-30212/T2) Avail: NTIS HC A03/MF A01

The possibility of extending the usefulness of the Venturi as a gas/solids meter to larger particle sizes by modifying the inlet geometry was investigated. The adaptability of the annular Venturi to meter gas-solids flows in length-constrained systems has also been investigated. The optimal inlet geometry to maximize the Venturi sensitivity to loading was identified. Laser light attenuation across the throat section of the venturimeter was carried out to determine if such measurements could provide an independent measure of solids loading in the gas/solids suspension. DOE

N82-16381# Los Alamos Scientific Lab., N. Mex.
COAL-GASIFICATION INSTRUMENTATION PROGRAM (PR 11734) Quarterly Progress Report, 1 Jul. - 30 Sep. 1981
1 Oct. 1981 38 p refs
(Contract W-7405-eng-36)
(DE82-001153; DOE/TIC-2001153) Avail: NTIS HC A03/MF A01

Methods of measuring alkali metals, NO, NH3 and H2S in coal gasification products are being studied using laser-induced breakdown spectroscopy, coherent anti-Stokes Raman spectroscopy and infrared spectroscopy. Detection limits under various conditions and comparison with gas chromatography results are presented. DOE

N82-16382# Science Applications, Inc., Las Vegas, Nev. Nuclear Instrumentation Div.
TAPE RECORDING AND TRIGGERING SYSTEMS Open File Report, 20 Jun. 1978 - 15 Aug. 1979
Kenneth R. Sites and Lawrence A. Millonzi 7 Jun. 1981 17 p ref
(Contract DI-BM-H0-282926)
(PB81-243248; BM-OFR-116-81) Avail: NTIS HC A02/MF A01 CSCL 14C

Two tape recording and triggering systems were developed and delivered for use in the microseismic program. The systems are designed to improve the effectiveness of the Sangamo 3500 series and SABRE VI instrumentation tape recorders. The system is designed to capture random microseismic data, digitize and temporarily store these data, start the tape recorder, and then transfer the data to magnetic tape for permanent storage. The system is designed to pack data on tape such that the tape may be simply played back through galvo drives onto an oscillograph such that a continuous series of analog records, with corresponding time of day information, are reproduced without excessive oscillograph paper waste or the need for the operator to search for valid events. GRA

N82-16383# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
HIGH-VOLTAGE TESTING CURRENT MEASUREMENT TECHNIQUES
B. Milano Jun. 1981 12 p
(PB81-240038; REC-ERC-81-9) Avail: NTIS HC A02/MF A01 CSCL 14B

A discussion of the effects of power supply ripple on dc insulation testing is presented. A meter to overcome these effects is described. Equations indicating the ripple effects are developed. Author

N82-16384# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
A SYSTEM FOR MEASURING STEADY-STATE TORQUE ON A ROTATING SHAFT
E. Campbell Apr. 1981 19 p refs
(PB81-240632; REC-ERC-81-2) Avail: NTIS HC A02/MF A01 CSCL 14B

A system to transfer torque signals from a rotating shaft to stationary equipment using a transformer concept is described. The system has error correcting capabilities to eliminate drift. The system was successfully used on large generators and pumps. Author

N82-16385# Dynamic Science, Phoenix, Ariz.
ADVANCED RECORDER DESIGN AND DEVELOPMENT Final Report, Jun. 1977 - Feb. 1981
Carroll D. Thatcher Feb. 1981 192 p refs
(Contract DOT-HS-7-01640)
(PB81-244105; DOT-HS-805914) Avail: NTIS HC A09/MF A01 CSCL 13L

A prototype crash recorder measuring and storing time histories of vehicle lateral and longitudinal accelerations, during a collision was designed, fabricated, and subjected to environmental tests. The recorder features low cost accelerometers, signal conditioning circuitry, A/D converter, microprocessor and digital storage. Accelerometer outputs are continuously sampled and stored in digital memory. The microprocessor monitors Delta V and compares it to a selectable criterion. When Delta V exceeds the criterion recent acceleration time histories are permanently stored in memory. The stored signals include acceleration data prior to and subsequent to the crash event. Methods of implementing the recorder including discussion of distribution in

vehicle fleets, data retrieval, including hardware and software, and data processing software are provided. DOE

N82-16386# Spectron Development Labs., Inc., Costa Mesa, Calif.
DEVELOPMENT OF A PIPE LOCATION SYSTEM Final Report, Sep. 1980 - Jun. 1981
B. P. Hildebrand 15 Jun. 1981 52 p refs
(GRI Proj. 5080-353-0335)
(PB81-246530; SDL-81-2163-09DF; GRI-80/0068) Avail: NTIS HC A04/MF A01 CSCL 14E

A portable system capable of making an image of buried structures, such as pipe, and displaying it in real time in an isometric format was investigated. Linear impulse holography was developed to convert either acoustic or radar time-of-flight data into such an image containing all information required to accurately locate the pipe. GRA

N82-16387# KLD Associates, Inc., Huntington, N. Y.
ACOUSTICAL CONCEPT FOR MEASURING PARTICLE SIZE DISTRIBUTIONS
David S. Mahler Feb. 1981 74 p refs
(Grant NSF DAR-80-09595)
(PB81-235301; NSF/DMR-81001) Avail: NTIS HC A05/MF A01 CSCL 14B

A device for measuring particle size and distribution for air pollution control applications was investigated. The Acoustic Particulate Monitor, can measure total mass loading, mean particle diameter, and width of particle size distributions on an in-situ basis. It is based on observations that the presence of dust in air causes a reduction in the speed of sound as a function of transmitted frequency. Reductions in sound speed are small and the accompanying shift in the acoustical phase is a highly sensitive method for detecting such effects. Magnitudes of phase shift are related to mass loading. The frequency associated with maximum phase shift is defined as the acoustic frequency, fA. Experimentally determining fA provides a measure of the mean particle size of the distribution. Experimental results were verified using direct mass measurements and microphotographs. GRA

N82-16388# National Bureau of Standards, Washington, D.C. National Engineering Lab.
CRYOGENIC FLUIDS DENSITY REFERENCE SYSTEM: PROVISIONAL ACCURACY STATEMENT (1980)
J. D. Siegwarth and J. F. LaBrecque Apr. 1981 61 p refs Sponsored by Gas Research Inst.
(PB81-244865; NBS-TN-1041) Avail: NTIS HC A04/MF A01 CSCL 14B

An improved Density Reference System, reference densimeter, and method of determining sample density are described. The uncertainty of the density reference system is + or -0.055 percent. The contribution from the estimated systematic error in density was + or -0.022 percent. The estimated uncertainty caused by random error is three times the standard deviation of 0.011 percent and is based on measurements of densities of saturated liquid methane. Total density uncertainty is the sum of the systematic and random errors for a density range of 400 to 480 kg/cu m at pressures from 0.8 to 4 bar absolute and temperatures between 109 and 128 K. This accuracy statement is expected to apply over ranges of at least 400 to 1000 kg/cu m in density, 77 to 300 K in temperature and 0.8 to 7 bar in pressure. This system has great accuracy, speed, reliability, and flexibility. GRA

N82-16389# Harvard Univ., Cambridge, Mass.
PLATINUM: THE PRICE OF PHOTOGRAPHIC PRINTING MATERIALS
Debbie Hess Norris 1981 18 p refs
(Grant NEA-92-2033-386)
(PB81-249542) Avail: NTIS HC A02/MF A01 CSCL 14E

The historical development and subsequent modifications of the platinum printing process are discussed. Chemical structure, surface character, and typical deterioration encountered with platinum prints are identified. Possible procedures and problems encountered during treatment are presented. GRA

N82-16390# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
NBS PHASE ANGLE CALIBRATION STANDARD Final Technical Note
R. S. Turgel, N. M. Oldham, G. N. Stenbakken, and T. H. Kibalo Jul. 1981 130 p refs Sponsored by Dept. of Defense
(PB81-244899; NBS-TN-1144) Avail: NTIS HC A07/MF A01 CSCL 14B

The construction and operation of a calibration standard designed for use with phase meters is described. The resolution of the calibrator is approximately 2 millidegrees and its accuracy is of the order of 5 to 10 millidegrees depending somewhat on frequency and amplitude ratio of the output. Author (GRA)

N82-16391# National Bureau of Standards, Washington, D.C. Center for Materials Science.
TECHNICAL ACTIVITIES 1980: CENTER FOR MATERIALS SCIENCE
John B. Wachtman, Jr. and John D. Hoffman Oct. 1980 480 p refs
(PB81-245318; NBSIR-80-2108) Avail: NTIS HC A21/MF A01 CSCL 14B

Part of the National Measurement Laboratory, one of the principal laboratories comprising the National Bureau of Standards, the Materials Science Center is organized in six divisions, each having responsibility in different areas of materials science appropriate to the major classes of materials metals, polymers, and ceramics and glass. These Divisions vary in their balance between theory and experiments, between direct standards work and research, and in their orientation toward industrial and Government needs and the needs of other components of the scientific and technical community. Achievements reported relate to signal processing and imaging; fracture theory; conformational changes in polymers; chemical stability and corrosion; fracture deformation; polymer science and standards; metallurgy and alloys; ceramics, glass, and solid state; and reactor radiation. GRA

N82-16392# National Bureau of Standards, Washington, D.C. Electromagnetic Technology Div.
WR 10 MILLIMETER WAVE MICROCALORIMETER
Manly P. Weidman and Paul A. Hudson Jun. 1981 18 p refs
(PB81-246639; NBS-TN-1044) Avail: NTIS HC A02/MF A01 CSCL 14B

A microcalorimeter has been built in WR 10 waveguide, 75-110 GHz, to serve as a power standard at the National Bureau of Standards. Included here is an evaluation of the errors in using the microcalorimeter for the measurement of effective efficiency of bolometer mounts. DOE

N82-16393# National Bureau of Standards, Washington, D.C. Center for Absolute Physical Quantities.
TECHNICAL ACTIVITIES 1980 CENTER FOR ABSOLUTE PHYSICAL QUANTITIES
Karl G. Kressler Oct. 1980 236 p refs
(PB81-248478; NBSIR-80-2165) Avail: NTIS HC A11/MF A01 CSCL 14B

Research projects, measurement method development, calibration and data evaluation activities are summarized. These activities fall in the areas of quantum metrology, measurements and standards for electrical units, temperature and pressure, length and mass, time and frequency, and quantum physics. Author

N82-16394# National Bureau of Standards, Washington, D.C. Thermal Processes Div.
ANALYSIS OF RESULTS OF MINI ROUND ROBIN REFLECTANCE TEST
Joseph C. Richmond Jul. 1981 34 p
(PB81-244873; NBSIR-81-2311) Avail: NTIS HC A03/MF A01 CSCL 14B

A mini round robin test was conducted in which four national laboratories participated. The spectral directional-hemispherical reflectance for near-normal incidence of two samples, one black and one white, was measured in the wavelength range of 250 to 2500 nm. The solar reflectance of the white sample and the solar absorptance of the black sample was then computed. Each

laboratory used a different procedure for making the computations. GRA

N82-16395# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
A CALIBRATION SERVICE FOR ANALOG-TO-DIGITAL AND DIGITAL-TO-ANALOG CONVERTERS Final Report
T. M. Souders, D. R. Flach, and B. A. Bell Jul. 1981 75 p refs Sponsored in part by Dept. of Defense
(PB81-243404; NBS-TN-1145) Avail: NTIS HC A04/MF A01 CSCL 14B

A calibration service for high performance 12- to 18-bit analog-to-digital converters (ADC's) and digital-to-analog converters (DAC's) is described. The service offers comprehensive measurements of linearity, differential linearity, gain, offset, and rms input noise (for ADC's), with systematic uncertainties as low as 3 ppm. Measurements are made at a minimum of 1024 different codewords. The measurement approach, design features, test programs, and data reduction techniques are documented, as are the methods of error estimation and quality control. Representative reports of tests are included for both DAC's and ADC's. Author (GRA)

N82-16103*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROPER FREQUENCIES OF A DOWN-LOOKING WATER-VAPOR RADIOMETER OVER SEA SURFACE
S. C. Wu *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 4-14 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

N82-16113*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
X-BAND NARROW-BEAM RADIOMETER FOR DSS 13
M. M. Franco, S. D. Slobin, and C. T. Stelzried *In its* the Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 80-86 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 14B

N82-17066*# Alabama A & M Univ., Huntsville. Dept. of Physics.
DETERMINATION OF THE EFFICIENCY OF A PROPORTIONAL COUNTER FOR DETECTING X-RAYS
Alton C. Williams *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 6 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-16396* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER MEASURING SYSTEM FOR INCREMENTAL ASSEMBLIES Patent
John G. Etzel and James A. Munford, inventors (to NASA) Issued 10 Nov. 1981 6 p Filed 7 Dec. 1979 Supersedes N80-18380 (18 - 09, p 1142)
(NASA-Case-GSC-12321-1; US-Patent-4,299,492; US-Patent-Appl-SN-102001; US-Patent-Class-356-386; US-Patent-Class-356-349) Avail: US Patent and Trademark Office

Wire-wrapped frame assemblies used in spark chambers and the like can be measured using a system which utilizes a laser, an interferometer, and a retroreflector to precisely measure distance. A light source and a photodetector are located adjacent the incremental assembly and mounted on a movable carriage. The interferometer is also mounted on the movable carriage, while the laser and retroreflector are positioned at either end of the carriage track. The carriage is moved along one edge of the incremental assembly between the retroreflector and the laser, and as the carriage is moved, the light from the light source to the photodetector is interrupted. This produces a trigger command to a control unit which in turn causes a distance measurement to be made. A printout is provided for each sampling trigger command to list such items as ideal position, actual position and amount of error.
Official Gazette of the U.S. Patent and Trademark Office

N82-16397# Washington State Univ., Pullman. Dept. of Physics.
STABILITY OF OPTICAL COATINGS IN HOSTILE EXCIMER LASER ENVIRONMENTS Annual Technical Report, Jul. 1980 - 30 Jun. 1981
Ansgar W. Schmid 31 Aug. 1981 52 p refs
(Contract N00014-80-C-0709)
(AD-A106756; AD-E001180) Avail: NTIS HC A04/MF A01 CSCL 20/5

E-beam evaporated SiO2 films were investigated during and after exposure to XeF laser gas components. Experimental methods and results are described, indicating that (1) impurities in the films reduce chemical film stability even without laser photons present; (2) low energy ions from the laser plasma enhance film decomposition; (3) mirror substrate temperature between room temperature and 100 C does not influence etching significantly. GRA

N82-16398# Naval Research Lab., Washington, D. C. Plasma Physics Div.
NON-LINEAR ANALYSIS OF THE FREE ELECTRON LASERS UTILIZING A LINEAR WIGGLER FIELD Interim Report
Cha-Mei Tang and P. Sprangle 19 Oct. 1981 35 p refs
(DARPA Order 3817)
(AD-A106229; NRL-MR-4354) Avail: NTIS HC A03/MF A01 CSCL 20/5

A one dimensional steady state (FEL) amplifier, utilizing a linearly polarized magnetic wiggler field, is analyzed in the linear and non-linear operating regimes. Our formulation of the FEL problem includes all the efficiency enhancements schemes, electron beam thermal effects and collective effects, i.e., space charge waves. The axial electron velocity, due to a linearly polarized wiggler field, has a spatially oscillatory component. It is shown that this axial velocity jiggle does not result in phase incoherence between the electrons and the ponderomotive wave. The axial velocity jiggle is explicitly incorporated into our analytical model. The inclusion of the electron jiggle velocity is shown to have a quantitative effect on the non-linear wave particle dynamics. The electron trapping potential associated with the ponderomotive wave is also derived. Finally, a number of numerical examples pertinent to the design of a 10 micron FEL amplifier are presented. GRA

N82-16399# National Bureau of Standards, Washington, D.C.
LASER INDUCED DAMAGE IN OPTICAL MATERIALS Final Report
Harold E. Bennett, Alexander Glass, J. (LLL), Arthur H. Guenther (AFWL, Kirtland AFB, N. Mex.), and Brian E. Newman (LASL) Oct. 1981 486 p refs Proc. of symp. held in Boulder, Colo., 30 Sep. - 10 Oct. 1980
(AD-A106548; NBS-SP-620; LC-81-600110) Avail: NTIS MF A01; SOD HC $9.50 CSCL 20/5

The Symposium was divided into sessions concerning Materials and Measurements, Mirrors and Surfaces, Thin Films, and finally Fundamental Mechanisms. The emphasis of the papers presented at the Symposium was directed toward new frontiers and new developments. Particular emphasis was given to materials for high power systems. The wavelength range of prime interest was from 10.6 microns to the uv region. Highlights included surface characterization, thin film-substrate boundaries, and advances in fundamental laser-matter threshold interactions and mechanisms. The scaling of damage thresholds with pulse duration, focal area, and wavelength was discussed in detail. GRA

N82-16400# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
RATE ENHANCEMENT RESULTING FROM REAGENT VIBRATIONAL EXCITATION AS ESTIMATED BY THE BEBO METHOD
Norman Cohen and Stanley W. Mayer 1 Sep. 1981 27 p refs
(Contract F04701-80-C-0081)

(AD-A106431; TR-0081(6940-01)-1; SD-TR-81-64) Avail: NTIS HC A03/MF A01 CSCL 20/5

The bond-energy bond-order (BEBO) method for calculating rate coefficients and activation energies on the basis of molecular properties has been applied to estimating rate coefficients and activation energies for H-transfer reactions involving vibrationally excited reactants. The reactions examined included Br + H2(v equals 0, 1) equals H + HBr, Br + HC1(v equals 0, 1, 2) equals C1 + HBr, and F + HC1(v equals 0, 1) equals C1 + HF. Good agreement was obtained between the computed BEBO rate coefficients and published rate coefficients. It is important to note that the rate enhancement resulting from vibrational excitation could be explained for most of the reactions as being largely caused by the lower bond dissociation energy of the vibrationally excited reagent. Because of the significance of vibrational de-excitation rates in chemical lasers, BEBO computations were made for HF and DF deexcitation by reactions with H, D, F, and other atoms. The highest computed deexcitation rate coefficients were those involving reactions with F-atoms. Reagent vibrational excitation to v equals 10 was examined. Computations were also made to estimate rate coefficients for several possible deuterium isotope separation methods based on the use of vibrationally excited reactants. Author (GRA)

N82-16401# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

VIBRATIONAL RELAXATION OF DF (V=1 AND 3) IN H2, D2, N2, AND HF AT 200 K

J. F. Bott 1 Sep. 1981 24 p refs

(Contract F04701-80-C-0081)

(AD-A106142; TR-0081(6603)-1; SD-TR-81-66) Avail: NTIS HC A02/MF A01 CSCL 20/5

The laser-induced fluorescence technique was used to measure the rate coefficients for the deactivation of DF(v = 1) and DF (v = 3) in H2, D2, N2, and HF at 200 + or - 5 K. The rate coefficients for deactivation by H2, N2, and HF were found to scale with v as v to the 1.9 + or - 0.1 power, essentially the same as the scaling at 295 K. The relaxation rates for DF(v = 1) were compared with data obtained at higher temperatures. At 200 K, the exchange probability of HF(1) + H2(O) was the same as that of DF(1) + D2(O) (within 10%) when the endothermicities were considered. Author (GRA)

N82-16402# University of Southern California, Los Angeles.

LASER KINETIC SPECTROSCOPIC STUDIES (A) THE UNIMOLECULAR REACTIONS OF NITROALKANES AND, (B) ELEMENTARY REACTIONS IMPORTANT IN COMBUSTION Annual Progress Report, 1 Jan. - 31 Aug. 1981

R. C. Estler, H. Reisler, and C. Wittig 31 Aug. 1981 37 p refs

(Contract N00014-80-C-0539)

(AD-A107820) Avail: NTIS HC A03/MF A01 CSCL 20/5

The multiphoton ionization (MPI) of NO is used to probe the dynamics of the photodissociation of NO2 in a one-color experiment. The resulting MPI spectra clearly indicate the high internal rotational energy in the NO ragment. MPI shows promise as a highly-sensitive, information-rich diagnostic for internal state determinations of nitric oxide. We report that the 300 K reaction of C2H with O2 has as one of its product channels CH + CO2. By monitoring time resolved CH chemiluminescence following laser photolysis production of C2H in the presence of O2, we have measured rate coefficients for reactions of C2H with O2, H2, and CH4. GRA

N82-16403# Washington State Univ., Pullman. Picosecond Laser Lab.

NANOSECOND AND PICOSECOND SPECTROSCOPY AND KINETICS OF DYNAMIC ABSORBING MATERIALS Final Report, Jun. 1976 - Jun. 1981

Maurice W. Windsor 8 Oct. 1981 132 p refs

(Grant DAAG29-76-G-0275)

(AD-A107733; ARO-14081.11-C) Avail: NTIS HC A07/MF A01 CSCL 20/5

There is an increasing need to provide protection for both personnel and electronic sensors against laser radiation in the visible and near infra-red regions. The proliferation of laser frequencies and the advent of tunable lasers combine to create a threat that static filters alone cannot combat. Dynamic filters that become highly absorbing only on exposure to the incident laser radiation would provide an attractive solution, especially if the dynamic absorption could be made to develop very rapidly and also be rapidly reversible after the laser pulse is over. This report describes research aimed at the further development of ultra-fast spectroscopic instrumentation constructed in the author's laboratory and its application to studying several phenomena capable of giving rise to dynamic absorption in selected classes of chemical compounds. These phenomena include the direct photoproduction on the picosecond time scale of absorbing transient species such as excited singlet states and excited triplet states of conjugated organic molecules and dyes, the production of radical ions of similar compounds via photoexcitation followed by fast electron transfer and the production of various excited states of inorganic complexes. A low-cost automated, picosecond laser spectrometer based on a two-dimensional optical multichannel analyzer (OMA) interfaced to a home assembled microcomputer has been developed. GRA

N82-16404# United Technologies Research Center, East Hartford, Conn.

ENERGETICS AND COLLISION DYNAMICS OF ELECTRONIC TRANSITION LASERS Final Report, 1 Aug. 1980 - 31 Jul. 1981

H. Harvey Michels and R. H. Hobbs Sep. 1981 46 p refs

(Contract F49620-80-C-0095; AF Proj. 2303)

(AD-A107591; UTRC-R81-925293; AFOSR-81-0750TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Knowledge of the partition of energy between the products of a chemical reaction is fundamental to understanding the dynamics of collisional reactions. Atom-atom and atom-molecule reactions that yield vibrationally excited diatomic molecules are of particular scientific and military interest. An understanding of the dynamics of these reactions and of at least limited regions of potential energy surfaces is important in analyzing and predicting vibrational and rotational relaxation rates. A program to develop theoretical techniques and construct computer programs for calculating potential energy surfaces and kinetic cross sections for calculating potential energy surfaces and kinetic cross sections for simple collision processes is discussed. The potential energy surfaces of concern include both atom-atom and atom-diatom systems with special emphasis on molecular reactions yielding electronically excited products which have potential as visible or UV chemical lasers. These systems include metal oxides and halides, metal excimers and the noble gas-halides. GRA

N82-16405# Avco-Everett Research Lab., Mass.

RECYCLABILITY ISSUES IN XeF LASERS Final Technical Report, 15 Jun. 1980 - 15 Apr. 1981

A. Mandl, R. Slater, and D. Trainor Wright-Patterson AFB, Ohio AFWAL Aug. 1981 60 p refs

(Contract F33615-80-C-2060; AF Proj. 2301; AF Proj. 3938)

(AD-A107759; AFWAL-TR-81-2085) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report describes three experiments designed to assess various aspects of XeF laser operation at elevated temperatures. Measurements of the rate of loss of NF3 and NF2 in contact with metals and quartz were obtained in one experiment. Nickel, quartz and aluminum appear to be less reactive than titanium, stainless steel and copper. The feasibility of using metal-filled reactors to scrub F2 from XeF laser gas mixtures was investigated. Titanium was shown to be a selective F2 scrubber. XeF laser performance was studied as a function of NF3 and NF2 mole fractions. These experiments indicate that the presence of NF2 degrades laser performance using a stainless steel cell. The cell construction material appears to play a significant role in determining the extent of degradation. Author (GRA)

N82-16406# California Univ., Livermore. Lawrence Livermore Lab.

AUTOMATIC GAS-LEVITATION SYSTEM FOR VACUUM DEPOSITION OF LASER-FUSION TARGETS

C. W. Jordan, G. R. Cameron, R. M. Krenik, and J. K. Crane 8 Sep. 1981 13 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981

(Contract W-7405-eng-48)

(DE82-000296; UCRL-86185; CONF-8111113-8) Avail: NTIS

HC A02/MF A01

An improved simple system was developed to gas-levitate microspheres vacuum-deposition processes. The automatic operation relies on two effects: a lateral stabilizing force provided by a centering-ring; and an automatically incremented gas metering system to offset weight increases during coatings. The system is described. DOE

N82-16407# KMS Fusion, Inc., Ann Arbor, Mich.
LASER HEATED GAS-JET: A SOFT X-RAY SOURCE
G. Charatis, D. C. Slater, F. J. Mayer, J. A. Tarvin, G. E. Busch, D. Sullivan, D. Musinski, D. L. Matthews (California Univ., Livermore, Lawrence Livermore Lab.), and Lou Koppel (California Univ., Livermore. Lawrence Livermore Lab.) 1981 6 p refs Presented at the Topical Conf. on Low-Energy X-Ray Diagnostics, Livermore, Calif., 8 Jun. 1981
(Contract DE-AC08-78DP-40030)
(DE81-029627; KMSF-U-1109; CONF-810651-7) Avail: NTIS HC A02/MF A01

The laser irradiated gas jet soft X-ray source in scattering processes was studied. It is a reproducible and stationary source with large yield and plasma properties characterized by conventional diagnostic techniques. X-ray pinhole photographs show an axially symmetric radiating plume located at the electron density critical surface. The density gradient is obtained by holograhic interferometry using a 0.26 microwavelength probe pulse. Electron temperatures are determined by spatially resolving X-ray crystal spectroscopy to record and analyze line emission from H and He like configurations. DOE

N82-16115*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POWER EFFICIENCY OF SEMICONDUCTOR INJECTION LASERS
J. Katz *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 94-100 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20E

N82-16116*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHASE-LOCKING OF SEMICONDUCTOR INJECTION LASERS
J. Katz *In its* the Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 101-114 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-16408* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SURFACE CONFORMING THERMAL/PRESSURE SEAL Patent
Martin L. Stevens, inventor (to NASA) (Fairchild Republic Co.) Issued 22 Sep. 1981 9 p Filed 12 Dec. 1979 Supersedes N80-114400 (18 - 05, p 0605) Sponsored by NASA
(NASA-Case-MSC-18422-1; US-Patent-4,290,612; US-Patent-Appl-SN-102593; US-Patent-Class-277-81R; US-Patent-Class-277-189; US-Patent-Class-244-113; US-Patent-Class-244-217; US-Patent-Class-244-163; US-Patent-Class-418-113; US-Patent-Class-418-142) Avail: US Patent and Trademark Office CSCL 11A

An assembly is disclosed for sealing a variable gap between the surface of element and a second element in movable relation to it. A seal housing is attached to the second element for movement therewith and has a sealing surface. At least one elongated seal member carried by the housing has first and second conjugate sealing surfaces. The first sealing surface is for rubbing and sealing engagement with the first element surface and the second sealing surface is for sliding and sealing engagement with the housing sealing surface. A biasing assembly may be carried by the housing for biasing the first and second conjugate sealing surfaces of the sealing member toward sealing engagement with the first element surface and housing sealing surface, respectively.

Official Gazette of the U.S. Patent and Trademark Office

N82-16409*# Transmission Research, Inc., Cleveland, Ohio.
TRACTION CONTACT PERFORMANCE EVALUATION AT HIGH SPEEDS Interim Report
Joseph L. Tevaarwerk (Applied Tribology Ltd.) Sep. 1981 193 p refs
(Contract DEN3-35; EC-77-A-31-1011)
(NASA-CR-165226; DOE/NASA/0035-1) Avail: NTIS HC A09/MF A01 CSCL 13I

The results of traction tests performed on two fluids are presented. These tests covered a pressure range of 1.0 to 2.5 GPa, an inlet temperature range of 30 °C to 70 °C, a speed range of 10 to 80 m/sec, aspect ratios of .5 to 5 and spin from 0 to 2.1 percent. The test results are presented in the form of two dimensionless parameters, the initial traction slope and the maximum traction peak. With the use of a suitable rheological fluid model the actual traction curves measured can now be reconstituted from the two fluid parameters. More importantly, the knowledge of these parameters together with the fluid rheological model, allow the prediction of traction under conditions of spin, slip and any combination thereof. Comparison between theoretically predicted traction under these conditions and those measured in actual traction tests shows that this method gives good results. Author

N82-16410*# Eaton Corp., Southfield, Mich. Engineering and Research Center.
SMALL PASSENGER CAR TRANSMISSION TEST: CHEVROLET MALIBU 200C TRANSMISSION WITH LOCKUP
M. P. Bujold Aug. 1981 245 p refs
(Contracts DEN3-124; DE-AI01-77CS-51044)
(NASA-CR-165182; DOE/NASA/0124-6; ERC-TR-8125) Avail: NTIS CSCL 13F

The small passenger car transmission test was initiated to supply electric vehicle manufacturers with technical information regarding the performance of commercially available transmissions. This information would enable EV manufacturers to design a more energy efficient vehicle. With this information the manufacturers would be able to estimate vehicle driving range as well as speed and torque requirements for specific road load performance characteristics. This report covers the testing of a Chevrolet Malibu 200C automatic transmission with lockup. The transmission was tested in accordance with a passenger car automatic transmission test code (SAE J651b) which required drive performance, coast performance, and no load test conditions. Under these test conditions, the transmission attained maximum efficiencies in the mid 90 percent range both for drive performance test and coast performance tests. The torque, speed and efficiency curves map the complete performance characteristics for the Chevrolet Malibu 200C automatic transmission with lockup.

Author

N82-16411*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SEALS ON ROTOR SYSTEMS
David P. Fleming 1982 18 p refs Presented at the 52nd Shock and Vibration Symp., New Orleans 27-29 Oct. 1981; sponsored by NRL and the Machinery Vibration Monitoring and Anal. Meeting, Oak Brook, Ill., 30 Mar. - 1 Apr. 1982; sponsored by the Vibration Inst.
(NASA-TM-82786; E-1121) Avail: NTIS HC A02/MF A01 CSCL 11A

Seals can exert large forces on rotors. As an example, in turbopump ring seals film stiffness as high as 90 MN/m (500,000 lb/in) have been calculated. This stiffness is comparable to the stiffness of rotor support bearings; thus seals can play an important part in supporting and stabilizing rotor systems. The work done to determine forces generated in ring seals is reviewed. Working formulas are presented for seal stiffness and damping, and geometries to maximize stiffness are discussed. An example is described where a change in seal design stabilized a previously unstable rotor. Author

N82-16412*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF ARTIFICIALLY PRODUCED DEFECTS ON FILM THICKNESS DISTRIBUTION IN SLIDING EHD POINT CONTACTS
C. Cusano (Illinois Univ. at Urbana-Champaign) and L. D. Wedeven 1981 31 p refs Presented at the Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981; sponsored by the Am. Soc. of Lubrication Engr. and ASME
(NASA-TM-82732; E-1042) Avail: NTIS HC A03/MF A01 CSCL 20K

The effects of artificially produced dents and grooves on the elastohydrodynamic (EHD) film thickness profile in a sliding point contact were investigated by means of optical interferometry. The defects, formed on the surface of a highly polished ball, were held stationary at various locations within and in the vicinity of the contact region while the disk was rotating. It is shown that the defects, having a geometry similar to what can be expected in practice, can dramatically change the film thickness which exists when no defects are present in or near the contact. This change in film thickness is mainly a function of the position of the defects in the inlet region, the geometry of the defects, the orientation of the defects in the case of grooves, and the depth of the defect relative to the central film thickness. Author

N82-16413*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BASIC LUBRICATION EQUATIONS
Bernard J. Hamrock and Duncan Dowson (Leeds Univ.) Dec. 1981 87 p refs Repr. from Ball Bearing Lubrication, chapter 5, Sep. 1981
(NASA-TM-81693; E-209) Avail: NTIS HC A05/MF A01 CSCL 11H

Lubricants, usually Newtonian fluids, are assumed to experience laminar flow. The basic equations used to describe the flow are the Navier-Stokes equation of motion. The study of hydrodynamic lubrication is, from a mathematical standpoint, the application of a reduced form of these Navier-Stokes equations in association with the continuity equation. The Reynolds equation can also be derived from first principles, provided of course that the same basic assumptions are adopted in each case. Both methods are used in deriving the Reynolds equation, and the assumptions inherent in reducing the Navier-Stokes equations are specified. Because the Reynolds equation contains viscosity and density terms and these properties depend on temperature and pressure, it is often necessary to couple the Reynolds with energy equation. The lubricant properties and the energy equation are presented. Film thickness, a parameter of the Reynolds equation, is a function of the elastic behavior of the bearing surface. The governing elasticity equation is therefore presented. A.R.H.

N82-16414# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
HEAT SOURCE: MATERIALS INTERACTIONS DURING FUSION WELDING Annual Technical Report
T. W. Eagar, A. Block-Bolten, C. Allemand, D. Hardt, J. Katz, and C. Huntington 30 Apr. 1981 45 p refs
(Contract N00014-80-C-0384)
(AD-A107717; ATR-1) Avail: NTIS HC A03/MF A01 CSCL 13/8

The first year of progress in studies involving vapor emission from weld pools, design of an infrared microscope for measurement of the weld surface temperature, ultrasonic detection of the weld pool shape, surface reflectivity of aluminum, signal analysis of the weld noise voltage and reflectivity of aluminum by a carbon dioxide laser is summarized. The results presented are to date preliminary. GRA

N82-16415# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
HIGH-CURRENT RESISTANCE WELDING OF NUCLEAR-WASTE CONTAINERS
B. J. Eberhard and J. W. Kelker, Jr. Jul. 1981 19 p ref Presented at the 62nd Am. Welding Soc. Conf., Cleveland, 6-10 Apr. 1981
(Contract DE-AC09-76SR-00001)
(DE81-030403; DPSPU-80-30-9; CONF-810404-2) Avail: NTIS HC A02/MF A01

Upset welding was selected as the process best suited for sealing the fill hole in stainless steel canisters for high level nuclear wastes, since this process is amenable to use in a remotely operated facility. Welding parameters are readily controlled and dynamically recorded during the course of the weld. Weld quality can be controlled and assessed through control of the process. The process was shown to be suitable for producing welds up to 5 in. in diameter and having 0.38-in. throat thickness. Weld current of 230,000 A AC, electrode force of 75,000 lb, and weld time of 2.0 seconds were required for a 5-in. diameter weld. The welds have a wrought structure and the tensile strength of the weld metal equals or exceeds that of the annealed base material. The size weld that can be produced appears limited only by the ability to provide sufficient welding current. A welder designed to deliver 400,000 A DC is being installed in a nonradioactive nuclear waste pilot facility. DOE

N82-16416# Ricardo & Co., Engineers (1927) Ltd., Shoreham-by-Sea (England).
ACOUSTIC AND EMISSION CHARACTERISTICS OF SMALL, HIGH-SPEED INTERNAL COMBUSTION ENGINES Final Report, Jun. 1976 - Sep. 1979
D. Morrison and R. V. Karsick Jul. 1981 362 p Prepared for Calspan Advanced Technology Center
(Contract DOT-TSC-1242)
(PB82-104225; DOT-HS-805830) Avail: NTIS HC A16/MF A01 CSCL 13F

The acoustic aspects of small high speed internal combustion engines were evaluated. Outdoor noise tests on SAAB and Peugeot vehicles, and noise tests on a selection of European passenger vehicles, on the SAAB 2 liter gasoline engine, and on the Peugeot 2.3 liter diesel engine are described, and test results compared. An urban traffic noise model for high speed gasoline and diesel powered light duty vehicles is presented. Author (GRA)

N82-16417# Department of Energy, Bartlesville, Okla. Energy Technology Center.
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, THIRD SERIES, 1978 BUICK 196 CID (3.2L), 2V Interim Report, Jun. 1981
D. E. Koehler, W. F. Marshall, and K. R. Stamper Jun. 1981 57 p
(Contract DOT/TSC-RA-77-07)
(PB81-236630; BETC/OP-81/52; DOT-TSC-NHTSA-81-7; DOT-HS-805813; Rept-14) Avail: NTIS HC A04/MF A01 CSCL 21G

The 1978 Buick 196 CID engine was dynamometrically tested to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady state engine operating modes. The objective is to obtain engine performance data to estimating emissions and fuel economy for varied engine service and duty. The intent is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation. GRA

N82-16132*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTENNA AZIMUTH BEARING MODEL EXPERIMENT
H. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 291-306 ref (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 13I

N82-17080*# Wisconsin Univ. - Platteville. Dept. of Civil Engineering.
INCIPIENT FAILURE DETECTION (IFD) OF SSME BALL BEARINGS
In Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 13H

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-16418# Spectron Development Labs., Inc., Costa Mesa, Calif.
NEAR SURFACE FLAW DETECTION BY ULTRASONIC ANGLE IMAGING Final Report
B. Percy Hildebrand and Gerald L. Fitzpatrick 27 Feb. 1981 55 p refs
(Grant NSF DAR-80-09279)
(PB81-235939; SDL-81-2175-01F; NSF/DMR-81002) Avail: NTIS HC A04/MF A01 CSCL 14B

The use of measurable quantities to form images of near surface defects in ceramic and super alloy materials was examined. Ultrasound, the Rayleigh critical angle, is used as a sensitive indicator of near surface conditions. The behavior of reflected sound at this angle is influenced by material parameters such as grain size, hardness, surface residual stress, and material variation. Amplitude and phase of the reflected wave, frequency of least reflection, and the critical angle itself were used as measurable quantities. The combination of these measurables, determines separately grain size, surface stress, and material defects in the near surface region of the material. GRA

N82-16129*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SYSTEM RELIABILITY ANALYSIS WITH DYNAMIC PROGRAMMING
T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 246-267 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09D

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-16419*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELEVATED TEMPERATURE FATIGUE TESTING OF METALS
Marvin H. Hirschberg Dec. 1981 24 p refs
(NASA-TM-82745; E-1058) Avail: NTIS HC A02/MF A01 CSCL 20K

The major technology areas needed to perform a life prediction of an aircraft turbine engine hot section component are discussed and the steps required for life prediction are outlined. These include the determination of the operating environment, the calculation of the thermal and mechanical loading of the component, the cyclic stress-strain and creep behavior of the material required for structural analysis, and the structural analysis to determine the local stress-strain-temperature-time response of the material at the critical location in the components. From a knowledge of the fatigue, creep, and failure resistance of the material, a prediction of the life of the component is made. Material characterization and evaluation conducted for the purpose of calculating fatigue crack initiation lives of components operating at elevated temperatures are emphasized. J.D.H.

N82-16420# National Aerospace Lab., Tokyo (Japan).
ANALYSIS OF STRAIN DISTRIBUTION FOR FIBER REINFORCED COMPOSITES BY MOIRE METHOD
Shinichi Koshide Aug. 1981 21 p refs In JAPANESE; ENGLISH summary
(NAL-TR-681; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Analysis by the moire method of strain distribution on a plane of fiber reinforced composites with high rigidity was made. The strain distribution can be determined from moire fringe patterns and an electrical resistance strain gage, or fringe patterns which are obtained by a testing procedure using combined specimens. The fringe patterns are obtained by a fringe reconstructor which is an optical spatial filtering system with coherent light. The method was applied to analysis of strain distribution in strips of aluminum alloy and epoxy resin, with a circular notch, under tension. A comparison of the results with values of theoretical analysis confirms that the method is applicable to the determination of strain distribution on a plane of rigid structural materials, such as composites with circular or semi-circular notches. The influences of the notch on the mechanical properties of material under tension for each of the above composites is discussed. M.D.K.

N82-16421# Forest Products Lab., Madison, Wis.
STRENGTH AND STIFFNESS OF SMALL GLUED-LAMINATED BEAMS WITH DIFFERENT QUALITIES OF TENSION LAMINATIONS
Catherine M. Marx and Russell C. Moody May 1981 50 p refs
(AD-A106562; FSRP-FPL-381) Avail: NTIS HC A03/MF A01 CSCL 11/9

The objective of this research study was twofold: (1) to determine at what beam depth specially graded 302-24 (2) tension laminations are required to attain a 2,400 lb/sq. in. design stress; (2) to determine the appropriate design stress for specification type beams with the regular laminating grades of L1 Douglas Fir-Larch (DF-L) or No. 1D Southern Pine (SP) as the tension laminations. The 302-24 grade of lumber required for tension laminations on 24F4 deep beams is a limited resource and is not as readily available as L1 or No. 1D lumber now used as the tension lamination on 24F shallow beams thus necessitating objective (2). The 180 glued laminated beams evaluated were of near minimum quality; each selected tension lamination had a near maximum size, strength reducing characteristics positioned in the most highly stressed region of the test beams.
Author (GRA)

N82-16422# Forest Products Lab., Madison, Wis.
A SUMMARY OF MODULUS OF ELASTICITY AND KNOT SIZE SURVEYS FOR LAMINATING GRADES OF LUMBER
R. W. Wolfe and R. C. Moody Jun. 1981 22 p
(AD-A106561; FSGTR-FPL-31) Avail: NTIS HC A02/MF A01 CSCL 11/12

A summary of modulus of elasticity (MOE) and knot data is presented for grades of lumber commonly used to manufacture glued laminated (glulam) timber by the laminating industry. Tabulated values represent 30 different studies covering a time span of over 16 years. Statistical estimates of average and near maximum knot sizes as well as mean and coefficient of variation for MOE are given. Modulus of elasticity values are compared with those published for design. Author (GRA)

N82-16423# Materials Research Labs., Ascot Vale (Australia).
USE OF WEIGHT FUNCTIONS TO DETERMINE THE STRESS INTENSITY FOR A CRACKED THICK-WALLED CYLINDER
Graham Clark May 1981 21 p refs
(AD-A106270; MRL-R-814) Copyright. Avail: Issuing Activity CSCL 20/11

The use of weight functions to determine stress intensities for cracked specimens is relatively simple, and, while the initial derivation of a suitable weight function for some specimen geometries may be complex, the technique offers substantial benefits. In particular, stress intensities may be estimated for any initial stress distribution, and variations in stress intensity which result from the introduction of residual stress fields may be handled without the need to perform a full re-analysis for each case. The stress intensity at the tip of a crack which grows through a known stress field has been estimated using a weight function technique. The geometry considered is a thick-walled cylinder (Ro/Ri = 1.8) containing a longitudinal crack along the bore surface, and stress distributions corresponding to a variety of loading arrangements are used as examples.
Author (GRA)

N82-16424# Akron Univ., Ohio. Inst. of Polymer Science.
FAILURE LOADS FOR MODEL ADHESIVE JOINTS SUBJECTED TO TENSION, COMPRESSION OR TORSION
A. N. Gent and O. H. Yeoh 25 Oct. 1981 42 p refs
(Contract N00014-76-C-0408; NR Proj. 092-555)
(AD-A106724; TR-14) Avail: NTIS HC A03/MF A01 CSCL 11/1

A simple theoretical analysis, based upon Griffith's fracture criterion, has been developed to predict the loads required to cause adhesive failure when model joints are subjected to different types of loading, viz. Tension, compression, and torsion. Two model joints are considered: a rigid cylinder partly embedded in and bonded to an elastic cylinder (termed 'rod joint' here), and, an elastic cylinder inserted partway into, and bonded to, a rigid tube (termed 'sleeve joint' here). Both types of joint have been constructed, using vulcanized rubber cylinders bonded to aluminum rods and sleeves. Measurements have been made of the failure loads under tension, compression and torsional loading. They were found to be in satisfactory agreement with the theoretical predictions except, in some instances, for rod joints subjected to tension or torsional loading when the failure loads were as much as three times the predicted values. This discrepancy is attributed to friction between the partially-detached rubber cylinder and the embedded rod, enhanced to a major degree by the tendency of the rubber cylinder to shrink in radius on stretching or twisting. A theoretical analysis of the effect of friction is presented. It predicts increasingly large pull-out forces or torques, as the depth of embedment increases, until frictional seizure occurs. Experimentally, frictional effects were eliminated by applying an internal gas pressure to the region being detached. All of the failure loads were then found to be in satisfactory agreement with the original theory, ignoring frictional effects.
GRA

N82-16425# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
LARGE DEFORMATIONS NEAR THE TIPS OF AN INTERFACE-CRACK BETWEEN TWO NEO-HOOKEAN SHEETS
J. K. Knowles and Eli Sternberg Sep. 1981 74 p refs
(Contract N00014-75-C-0196)
(AD-A106147; TR-48) Avail: NTIS HC A04/MF A01 CSCL 20/11

This paper contains an asymptotic investigation (within the nonlinear theory of elastostatic plane stress) of the deformations and stresses near the tips of a traction-free interface-crack between two dissimilar semi-infinite Neo-Hookean sheets. The results obtained are free of oscillatory singularities of the kind predicted by the linearized theory, which would require the two deformed faces of an interface-crack to overlap in the vicinity of its tips. Instead, the crack is found to open smoothly near its ends, regardless of the specific loading at infinity. Author (GRA)

N82-16426# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CRITICAL ANGLES AND GRAZING INCIDENCE: THE BREAKDOWN OF REGULAR SHOCK REFLECTION IN SOLIDS
Thomas W. Wright Nov. 1981 58 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A107665; ARBRL-TR-02381) Avail: NTIS HC A04/MF A01 CSCL 20/11

The regular pattern for shock reflection in a nonlinear hyperelastic solid is a centered array of shocks and simple wave fans. As the angle of incidence approaches grazing incidence or a critical angle, the reflection pattern overtakes the incident wave until finally the regular pattern can no longer be sustained. By expanding the reflection solution in powers of ampliture about the linear reflection solution, it is possible to develop a procedure to solve the reflection problem for weak but finite shocks for any material symmetry. Explicit solutions can be exhibited for isotrophic materials, including relationships between amplitude and limiting angle for various boundary conditions and incident waves. Some problems require consideration of a nonlinear boundary condition even in the first approximation. Typically, these cases lead to considerable amplification in the leading reflected wave. Author (GRA)

N82-16427# TRW, Inc., McLean, Va.
ALTERNATIVES TO CERAMIC BRICKS AND CERAMIC-BRICK SYSTEMS
J. Michael MacDonald 1981 10 p refs Presented at the Thermal and Chem. Storage Ann. Rev. Meeting, Washington, D.C., 14-16 Sep. 1981
(Contract W-7405-eng-26)
(DE81-032029; CONF-810940-4) Avail: NTIS HC A02/MF A01

Alternative materials for use as thermal energy storage media in electric storage furnaces were evaluated and selected. Selections were based on low cost, availability, durability, and energy storage density. The materials selected were taconite pellets, river gravel, crushed stone, and crushed (air cooled) blast furnace slag. Essential material properties and energy storage densities were established. A conceptual design for an electric storage furnace using these low cost materials was developed. The performance of this conceptual furnace was characterized by an analytical model and a computer code for the model developed. Performance and design comparisons between present day furnaces and the prototype furnace were made. A significant cost advantage for the proposed furnace over existing electric storage furnaces cannot be established. DOE

N82-16428# California Univ., Livermore. Lawrence Livermore Lab.
CALCULATIONS OF ELASTIC WAVE SCATTERING FROM VOIDS AND CRACK-LIKE DEFECTS BY THE METHOD OF OPTIMAL TRUNCATION
Joel L. Opsal 29 Jun. 1981 7 p refs Presented at DARPA/AFML Review of Progress in Quantitative NDE Conf., La Jolla, Calif., 14-18 July 1980 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030770; UCRL-86333; CONF-800767-4) Avail: NTIS HC A02/MF A01

Visscher's method of optimal truncation for solving elastic wave scattering problems is applied to voids having surface cracks and sharp edges including some for which experimental data are becoming available. A number of interesting aspects of these results are discussed and comparisons with existing experimental data presented. DOE

N82-16429# Illinois Univ., Urbana. Lab. of Physics.
THERMAL EXPANSION OF ALKALI-GRAPHITE INTERCALATION COMPOUNDS
S. E. Hardcastle 1981 4 p refs Presented at the Intern. Conf. on Phonon Phys., Bloomington, Ind., 30 Aug. 1981
(Contract DE-AC02-76ER-01198)
(DE82-000060; DOE/ER-01198/1364; CONF-810872-3) Avail: NTIS HC A02/MF A01

The c-axis thermal expansion of several alkali-graphite intercalation compounds was measured by means of X-ray scattering between 15 and 300 K. The thermal expansion depends strongly on the stage of the compound and is largest for C8M (M = K, Rb, Cs) compounds. The data are analyzed in terms of an one-dimensional quasi-harmonic approximation, which yields Gruneisen parameters two or three times as large as for pristine graphite. DOE

N82-16430# California Univ., Livermore. Lawrence Livermore Lab.
STRESSED KEVLAR STRAND TEST
H. Golopol, J. Clarkson, R. Moore, and N. Hetherington 10 Sep. 1981 16 p refs Presented at the JOWOG 12/25 Conf., Aldermaston, England, 21-25 Sep. 1981; sponsored by AWRE
(Contract W-7405-eng-48)
(DE81-030769; UCRL-86034; CONF-810953-3) Avail: NTIS HC A02/MF A01

The effect of time, temperature, and chemical environment on the strength retention of stressed Kevlar strands were determined. A stess load of 20% of the ultimate tensile strength was applied. Strands were hung with a suitable weight in a closed container. Each container was then provided with its own heater and chemical environment. No significant loss of strength retention was found on these stressed strands. DOE

N82-16431# Washington Univ., Seattle. Dept. of Mechanical Engineering.

STATIC STRESS-INTENSITY FACTORS AND DYNAMIC CRACK PROPAGATION IN PIPES Annual Report, Sep. 1981
A. F. Emery, A. S. Kobayashi, and W. J. Love Sep. 1981 206 p refs Sponsored in part by EPRI
(EPRI Proj. 231-1)
(DE82-900365; EPRI-NP-2024) Avail: NTIS HC A10/MF A01

Predictive models for critical flaw sizes, initiation crack propagation of dynamic cracks in pipes, and behavior of dynamic crack propagation in compact specimens are described. Parametric results are reported that may be used to predict critical flaw sizes for the initiation of a running crack as well as the crack propagation rate under fatigue in precracked pressurized and thermally shocked cylinders and nozzle-cylinder intersections. Fundamental properties governing rapid crack propagation and crack arrest are described, as are studies on the initiation and propagation of circumferential through cracks in pipes subjected to axial tension. Included are discussions of the use (1) the three dimensional finite element code, SAP IV, to analyze the dynamic fracture response of preexisting axially oriented through cracks at the centers of a local bulge in pressurized pipe and (2) the thermal hydraulic code LEAKER to predict the nondimensionalized depressurization rates measured in a series of dynamic pipe-rupture experiments. GRA

N82-16432# Agbabian Associates, El Segundo, Calif.
INVESTIGATION OF REINFORCED BRICK MASONRY BUILDINGS UNDAMAGED BY THE SAN FERNANDO EARTHQUAKE
S. A. Adham May 1981 188 p refs
(Grant NSF PFR-79-00013)
(PB82-104217; NSF/CEE-81014) Avail: NTIS HC A09/MF A01 CSCL 13M

Behavior of the buildings of the Sepulveda Veterans Administration Hospital during the 1971 San Fernando earthquake was examined. The study explored why these buildings sustained minimal structural damage while other buildings in close proximity sustained major damage. A literature review was conducted and seismic input motions at the site during the earthquake were estimated. Verifications of seismic analysis techniques using a two dimensional finite element model were determined through studies of observed earthquake damage to a six-story building. Relative displacements were calculated at the expansion joints and compared to damage of the flexible joints. Also verified were seismic analysis techniques through a study of observed earthquake damage to the boiler house building. The calibrated motions were used as input to a three dimensional model of a reinforced brick masonry building. GRA

N82-16433# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
EVALUATION OF THE FRACTURE BEHAVIOR OF CONCRETE WITH THE J-INTEGRAL
Robert C. Andren, Thomas J. Powell, Frederick V. Lawrence, and Clyde Kesler Apr. 1981 150 p refs
(Grant NSF ENG-78-07742)
(PB81-235855; NSF/ECS-81003) Avail: NTIS HC A07/MF A01 CSCL 13C

The application of the J-integral concept to concrete fracture mechanics was investigated. The J-integral is path independent line integral that is a measure of the elasto plastic stresss strain field near a crack tip. Factors were evaluated to ascertain which ones significantly affect the performance of the J-integral as a one parameter measure of fracture toughness. The critical value of the J-integal (JC) was compared with other fracture toughness parameters. GRA

N82-16434# Sydney Univ. (Australia). Civil Engineering Labs.
EXPERIMENTS ON CONTINUOUS COMPOSITE BEAMS
P. Ansourian Mar. 1981 61 p refs
(PB81-247116; R-384) Avail: NTIS HC A04/MF A01 CSCL 20K

Six continuous composite beams of 9 m length and with compact steel section were tested. Two had limited rotation capacity and were tested under severe sagging rotation conditions; the other four were loaded symmetrically. The vertical shear resistance of the slab at interior supports assessed. It is concluded that simple plastic design incorporating full plastic moment values may be used in continuous composite beams were compact steel section, adequate slab and shear connection, even under conditions of severe rotation requirement. GRA

N82-16435# Sydney Univ. (Australia). Civil Engineering Labs.
BOLTED CONNECTIONS IN COMPOSITE STRUCTURES
P. Ansourian and Tokuzo Sase Jan. 1981 42 p refs
(PB81-247124; R-382) Avail: NTIS HC A03/MF A01 CSCL 20K

The behavior of composite connection specimens consisting of studded T-beams in negative bending and encased I-section columns bent about the major axis is examined. Both interior and exterior column connections are tested, with the joint between the major steel components effected with simple bolted joints. At interior columns, the ultimate behavior is almost indistinguishable from that of connections with welded joints, and the full plastic moment of the beam including all the reinforcement is exceeded. At external columns, the strength and stiffness are greatly enhanced by the slab and the concrete casing, but the plastic moment of the beam is not transmitted before brittle collapse of the slab. GRA

N82-17056*# Alabama A & M Univ., Huntsville. Dept. of Civil Engineering.
A STUDY OF COMPONENT DESIGN LOADS DUE TO DYNAMIC ENVIRONMENT
Rajinder S. Mehta *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 12 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20K

N82-17063*# Alabama Univ. in Huntsville. Dept. of Mathematics.
SURFACE CONTOUR OF A BIAXIALLY STRAINED, DOUBLY CURVED ANTENNA REFLECTIVE MESH
Annie V. Saylor *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE summer Fac. Fellowship Program Jan. 1982 11 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N82-16436* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY, WITH INDEXES, ISSUE 31
Oct. 1981 120 p refs
(NASA-SP-7041(31)) Avail: NTIS HC $10.50 CSCL 05B

This bibliograpny lists 505 reports, articles, and other documents introduced into the NASA scientific and technical information system. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. M.G.

N82-16437*# Wisconsin Univ. - Madison. Environmental Remote Sensing Center.

WETLAND MAPPING FROM DIGITIZED AERIAL PHOTOGRAPHY

F. L. Scarpace, B. K. Quirk, R. W. Kiefer, and S. L. Wynn, Principal Investigators [1982] 31 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (E82-10019; NASA-CR-164816) Avail: NTIS HC A03/MF A01 CSCL 08B

Aerial photographic imagery of the Sheboygan Marsh in Wisconsin was scanned through three different narrow band interference filters centered at .45, .55, and .65 micrometers. The output data was transformed into log exposures and corrected for lens fall-off. The scanned area was approximately 253 hectares, with each pixel representing an area of 6.0 meters square on the ground. Training sets were extracted from the digital file of the imagery using the map generated from the photointerpretation and computer generated character displays from the digital file as first approximations. From these training sets, statistics were generated to be used with an elliptical classifier. The classifier generated a digital file from which color coded thematic representations of the classifications could be produced. A two stage table-look-up elliptical algorithm was used as the classification procedure. The wetland boundary was easily delineated, but there was difficulty in mapping the boundaries of vegetation within the wetland. A.R.H.

N82-16438*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

PARTIALLY PROCESSED MULTISPECTRAL SCANNER LANDSAT HIGH-DENSITY TAPES REFORMATTING SYSTEM (HDT-AM/AMC) DESIGN SPECIFICATIONS

Omar J. Holguin, Principal Investigator Dec. 1980 37 p ERTS (Contract NAS9-15800)
(E82-10020; NASA-CR-161046; JSC-17101; LEMSCO-15905) Avail: NTIS HC A03/MF A01 CSCL 05B

The data interface formats and communication conventions used by the system (HDTRS) are defined. They are used to retrieve partially processed MSS and return beam vidicon type data. T.M.

N82-16439*# Wisconsin Univ., Madison. Inst. for Environmental Studies.

MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Progress Report, Aug. 1979 - Jul. 1980

Ralph W. Kiefer, Principal Investigator Jul. 1980 45 p ERTS (Grant NGL-50-002-127)
(E82-10021; NASA-CR-164815) Avail: NTIS HC A03/MF A01 CSCL 08H

Progress is reported in the following NASA-funded projects: (1) sediment plume study; (2) atmospheric correction to LANDSAT imagery; (3) demonstrating and evaluating opportunites for operational application of LANDSAT data in Wisconsin; and (4) the development of a facility to process imagery for the study of land cover, land use, water quality, electrophoresis gel analysis, prediction of storm and snow flow conditions, physical oceanography, and soils. Associated projects summarized are concerned with vegetation mapping in Sheboygan Marsh, surveying the Green Bay watershed to estimate the impact of land development on bay water quality; thermal scanning of ocean fronts; lake water quality, the Irondequoit River watershed, a model of thermal environment for land use planning, and changes in wetland vegetation near the Columbia Generating Station. Emphasis was focused on the selection of equipment for the efficient processing of images used for water-quality analysis and the development of supporting software for application by users. A.R.H.

N82-16440*# General Electric Co., Philadelphia, Pa. Space Div.

LANDSAT-2 AND LANDSAT-3 FLIGHT EVALUATION REPORT, 23 JANUARY TO 23 JULY 1980

1 Aug. 1980 241 p ERTS (Contract NAS5-21808)
(E82-10022; NASA-CR-164392; Doc-80SDS4229) Avail: NTIS HC A11/MF A01 CSCL 05B

Flight performance analyses of LANDSAT 2 and LANDSAT 3 are presented. Spacecraft operations and orbital parameters are summarized for each spacecraft. Data are provided on the performance and operation of the following onboard subsystems: power; attitude control; command/clock; telemetry; orbit adjust; magnetic moment compensation assembly; unified S-band/premodulation processor; electrical interface; thermal; narrowband tape recorders; wideband tape recorders; return beam vidicon; multispace multispectral scanner; and data collection. Orbit reference tables for January 1980 through July 1981 are included. A.R.H.

N82-16441*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

CNPQ/INPE: LANDSAT SYSTEM Progress Report, 1 Jun. 1980 - 30 Apr. 1981

Nelson deJesusParada, Principal Investigator and Marcio Nogueira Barbosa May 1981 26 p Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (E82-10023; NASA-CR-164814; INPE-2063-RPE/305) Avail: NTIS HC A03/MF A01 CSCL 05B

The current status of the Brazilian LANDSAT facilities is reported. The activities at the Cuiaba tracking and receiving station, and at the electronic processing and photo laboratories are presented. The image data bank is discussed. Operation statistics are given and include: scenes received and recorded, and scenes converted to images; images distributed to users and revenues; CCT's produced to users and revenues; images and CCT's distributed (summary); and LANDSAT data sales/distribution analysis for the year of 1980. The status of the LANDSAT-D project is also reported. T.M.

N82-16442*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REPORT ON A SHORT COURSE IN REMOTE SENSING AND THE GEOLOGICAL APPLICATIONS OF LANDSAT MSS IMAGERY AT INPE

Nelson deJesusParada, Principal Investigator and Kampta Persaud (Geological Survey Dept. (Guyana)) Oct. 1980 48 p refs Sponsored by NASA ERTS
(E82-10024; NASA-CR-164813; INPE-1923-RPE/249) Avail: NTIS HC A03/MF A01 CSCL 05B

Training in the theory of remote sensing in Brazil involves studying the principles of electromagnetic radiation and the instrumentation used to measure the radiation characteristics of a body. The overall LANDSAT system is considered with emphasis on the multispectral band scanner and Brazil's participation in the LANDSAT Program. Geologic information from MSS imagery is at a regional scale, and three basic types are available: rock and soil, geologic structures, and landforms. Discrimination between alluvium and sedimentary or crystalline bedrock, and between units in thick sedimentary sequences is best, primarily because of topographic expressions and vegetation differences. Discrimination between crystalline rock types is poor. Folds and fractures are the best displayed geologic features and are recognizable by topographic expressions, drainage patterns, and rock or vegetational tonal patterns. Landforms are easily discriminated by their familiar shapes and patterns. The IMAGE-100 computer has the ability to extract thematic information and to enhance the image. A.R.H.

N82-16443*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REMOTE SENSING DATA APPLIED TO LAND-USE SURVEY AT THE PARAIBA VALLEY

Nelson deJesusParada, Principal Investigator, Magda Adelaide Lombardo, Evlyn Marcia Leao DeMoraesNovo, Madalena Niero, and Celina Foresti May 1981 10 p refs Presented at the 7th Intern. Symp. on Machine Process. of Remotely Sensed Data, West Lafayette, Ind., 23-26 Jun. 1981 Sponsored by NASA ERTS
(E82-10025; NASA-CR-164812; INPE-2081-RPE/315) Avail: NTIS HC A02/MF A01 CSCL 08B

The Paraiba Valley (state of Sao Paulo) was selected as the test site in a study to develop a methodology for land-use survey and to determine the land-use modification rates using data of LANDSAT system. Both visual and automatic interpretation

methods were employed to analyze seven land-use classes. They are: urban area, industrial area, bare soil, cultivated area, pastureland, reforestation and natural vegetation. By means of visual interpretation little spectral differences among those classes were observed. The automatic classification of LANDSAT MSS data using maximum likelihood algorithm shows a 39% average error of omission and a 3.4% error of commission for the seven classes. The classification results were under the influences of the complexity of land-uses in the study area, the large spectral variations of analyzed classes and the low resolution of LANDSAT data. Author

N82-16444*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

BRAZILIAN REMOTE SENSING ACTIVITIES, CURRENT AND PROSPECTIVE NEEDS

Nelson deJesusParada, Principal Investigator Apr. 1981 55 p Presented at the United Nations Regional Seminar on Remote Sensing Appl. and Satellite Commun. for Education and Develop., Toulouse, 21-25 Apr. 1981 Sponsored by NASA ERTS

(E82-10026; NASA-CR-164811) Avail: NTIS HC A04/MF A01 CSCL 05A

Remote sensing activities began in Brazil in 1968 and are now concentrated in a satellite and a side-looking radar program. The radar program systematically surveys the natural resources of the whole national territory in a level of detail compatible with a 1:1,000,000 scale, focusing on geology, geomorphology, soil, agricultural aptitude, ecology, and potential land use. The satellite program receives, processes, and disseminates remotely sensed data (basically LANDSAT data) and develops methodologies for applying these data for surveying, monitoring and mapping. Special emphasis is given to national priorities, particularly food and energy. Major results obtained and difficulties encountered in the following applications are described: crop forecasting, reforestation, mineral exploration, fishing chart models, land use, sedimentation in reservoirs, and deforestation in the Amazon forest. A decision was made to upgrade existing LANDSAT reception and processing stations to receive and process MSS and thematic data from LANDSAT-D and from SPOT and to construct two satellites for launch in 1987-1990. A.R.H.

N82-16445*# South Dakota State Univ., Brookings. Remote Sensing Inst.

REMOTE SENSING APPLICATIONS TO RESOURCE PROBLEMS IN SOUTH DAKOTA Semiannual Progress Report, 1 Jul. 1980 - 1 Jan. 1981

Victor I. Myers, Principal Investigator, T. Bailey, R. G. Best, J. C. Eidenshink, D. Hause, H. Haivala, F. A. Schmer, M. Wehde, and K. Winks 1 Jan. 1981 102 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Grant NGL-42-003-007)

(E82-10027; NASA-CR-164810; SDSU-RSI-81-03) Avail: NTIS HC A06/MF A01 CSCL 05A

Data obtained from field studies, aerial color infrared photography, and LANDSAT imagery are being used for resources management in South Dakota. The procedures used and results obtained are described for the following applications: (1) detecting Dutch elm disease in the city of Watertown; (2) determining the distribution and abundance of grasshoppers in Corcon County; (3) inventorying sagebrush in Butte County to support sage grouse management; (4) computerized digitization of aerial thermography of the concentration of Canada geese on the Missouri River Reservoir; (5) surveying to determine the diversion of water along the Belle Fourche River from the Keyhole Reservoir in eastern Wyoming to the City of Belle Fourche in western South Dakota; (6) identifying and locating areas of the Lower James River where stream blockages, streambank erosion, and flooding occur; and (7) acquiring and analyzing data on the landcover in the Lake Herman watershed for the national pilot Model Implementation program. A.R.H.

N82-16446*# Stanford Univ., Calif. Remote Sensing Lab.

INTEGRATION OF LANDSAT WITH GEOLOGY AND AIRBORNE GEOPHYSICS INTO AN OPERATIONAL MINERAL EXPLORATION SYSTEM Final Report, Jun. 1978 - Dec. 1980

R. J. P. Lyon and M. F. Crawford, Principal Investigators Mar. 1981 270 p refs Prepared for JPL, Pasadena, Calif. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract JPL-955047)

(E82-10028; NASA-CR-164433) Avail: NTIS HC A12/MF A01 CSCL 08G

Digital data, gamma-ray spectrometry and aeromagnetic data were digitally combined and analyzed for the Bearlodge area (northeastern Wyoming) where potential resources of thorium and rare earths occur. The combined LANDSAT-geophysical data set revealed several geologic structures that were not evident in a single data set for the study area. Both qualitative and quantitative methods of analysis were performed on the combined data sets. Qualitative analysis of the data was done on a computer controlled, interactive color TV display system by overlaying the various data sets in different colors. In the Bearlodge area, this analysis revealed a pair of northwest-southeast tranding lineaments in the LANDSAT image which appeared to truncate a zone of high radioactivity. An elliptical feature formed by drainages is found. An intense thorium-gamma ray anomaly which coincides with thorium-rare earth mineralization, occurs inside this elliptical feature. T.M.

N82-16447*# Kansas Univ., Lawrence. Space Technology Center.

THE APPLICATION OF REMOTE SENSING TO RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY PROGRAMS IN KANSAS Annual Report, 1 Apr. 1980 - 31 Mar. 1981

B. G. Barr and E. A. Martinko, Principal Investigators Jul. 1981 164 p ERTS

(Grant NGL-17-004-024)

(E82-10029; NASA-CR-164756) Avail: NTIS HC A08/MF A01 CSCL 05A

Cooperative demonstration projects involved three principal areas of effort: agricultural and rural development; wildlife habitat and environmental quality; urban and regional planning. Several projects are reported including: an analysis of rangeland conditions in the Cimarron National Grasslands; an inventory of land use and land cover, particularly concerning forested lands, in two Indian reservations in northeast Kansas; an identification of homogeneous revenue regions in the state; an applied agricultural research and development project for Farmland Industries, Inc.; and an analysis of crop phenology and crop patterns in the high plains for identifying optimal dates of LANDSAT data for identifying irrigated lands. Several long-term projects include: weed pest surveys; irrigated lands data compilation from LANDSAT; and the development of an inventory of abandoned mined lands and potential hazard assessment in Kansas. T.M.

N82-16448*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

DOCUMENTATION OF COMPUTER PROCEDURES FOR LABELING SPRING GRAINS AND DISCRIMINATING BETWEEN SPRING WHEAT AND BARLEY USING LANDSAT DATA

Robert Horvath, Principal Investigator, J. A. Finkler, and E. P. Crist Jul. 1981 81 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15476; Proj. AgRISTARS)

(E82-10030; NASA-CR-161081; SR-EI-04131; ERIM-152400-5-T) Avail: NTIS HC A05/MF A01 CSCL 02C

The computer software necessary to perform two research labeling procedures is described and documented. The first labeling technique identifies spring small grain fields based on similarity of growing season and temporal spectral patterns of development in LANDSAT data. The second technique further labels these fields as either wheat, barley or unknown spring grain, based on their spectral position in Tasseled Cap Greenness-Brightness space for a given day around the dough stage of wheat. The subroutines which carry out the steps of the procedure are coded in PREFOR, a preprocessed FORTRAN. The subroutines were designed to fit into the U.S. Corn/Soybeam baseline procedure software developed for use in the AgRISTARS Program. Documentation of the subroutines are provided in an appendix. Author

N82-16449# Colorado Energy Research Inst., Golden.
OIL SHALE 1982: A TECHNOLOGY AND POLICY PRIMER
Nov. 1981 92 p refs Prepared in cooperation with Colorado School of Mines, Golden
Avail: NTIS HC A05/MF A01

An updated policy primer and technology assessment of the oil shale industry is presented for the benefit of policy makers and the general public. Methods for the development, management, and use of energy are discussed. The biological, economic, social, and political impacts and controversies surrounding current and future energy related activities are considered. Mining methods, retort processing, and methods for disposing of the shale are also discussed. M.D.K.

N82-16450# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SIMPLIFIED ALGORITHM FOR CALCULATING RADIATIVE TRANSFER IN SATELLITE IMAGES [ALGORITMO SIMPLIFICADO PARA CALCULO DE TRANSFERENCIA RADIATIVA EM IMAGENS DE SATELITE]
L. A. V. Dias, A. E. C. Pereira, and G. Camara Jul. 1981 17 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Reuniao Anual da SBPC, 8-15 Jul. 1981, Salvador, Brazil
(INPE-2169-RPE/385) Avail: NTIS HC A02/MF A01

Temporal variations of Earth's atmosphere may cause problems on remote sensing data analysis of satellites, such as LANDSAT, SKYLAB and NIMBUS-7. The apparent radiance of surface features which an orbiting spacecraft measures differs from the intrinsic surface radiance of the object, due to the presence of the intervening atmosphere of Earth. An algorithm for atmospheric correction is presented. J.D.H.

N82-16451*# National Aeronautics and Space Administration, Washington, D. C.
RELATIONSHIPS BETWEEN SOIL MOISTURE-HOLDING PROPERTIES AND SOIL TEXTURE, ORGANIC MATTER CONTENT, AND BULK DENSITY
Hugh C. F. Riley Aug. 1981 26 p refs Transl. into ENGLISH of Rept. no. 49 Kise Agricultural Research Station, Hedmark, Norway, 13 Mar. 1979 p 379-398 Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76674) Avail: NTIS HC A03/MF A01 CSCL 08M

Specimens from the surface horizon and the subsoil of 62 soil horizons in Hedmark and Oppland were investigated to study how the mechanical composition of the soil, the organic matter content and the bulk density affect their porosity and air capacity and their total and available water content. Most of the specimens belonged to the loam group, and a smaller number was from sandy and silty types of soil. Equations were established to make it possible to calculate the water retention curves and the amount of available water from the above mentioned parameters. As a rule, errors derived from the equations are no greater than those which are found in similar research in other countries. Author

N82-16452*# Texas Univ. at Arlington. Applied Research Labs.
DIGITAL CORRELATION OF DDRS DATA Final Report, 1 Oct. 1980 - 30 Sep. 1981
Carroll R. Griffin and James M. Estes 24 Nov. 1981 42 p refs
(Contract NAS9-16208)
(NASA-CR-167494; ARL-TR-81-51) Avail: NTIS HC A03/MF A01 CSCL 05B

The reduction of digital SAR (synthetic aperture radar) data to radar images for use in remote sensing applications was investigated. The critical software operations are discussed in detail, and suggestions and recommendations are made for improving the algorithms currently being used. J.M.S.

N82-16453# Mississippi State Univ., Mississippi State. Mississippi Remote Sensing Center.
DISCRIMATION OF UNIQUE BIOLOGICAL COMMUNITIES IN THE MISSISSIPPI LIGNITE BELT
W. Frank Miller and James D. Culter Jul. 1981 57 p refs Sponsored by the Mississippi Natural Heritage Program
Avail: NTIS HC A04/MF A01

Cost effective remote sensing techniques were developed for identifying large continuous areas of old growth hardwoods within Mississippi's lignite belt that do not exhibit signs of recent disturbance. General implementation of this study was carried out in three phases, with the intent of employing a multistage sampling technique. S.L.

N82-16454*# Ketron, Inc., Wayne, Pa.
UNDERGROUND COAL MINING SECTION DATA Final Report
Charles P. Gabrill and Jack T. Urie 24 Sep. 1981 151 p refs Prepared for JPL
(NASA-CR-168393; JPL-9950-601) Avail: NTIS HC A08/MF A01 CSCL 08I

A set of tables which display the allocation of time for ten personnel and eight pieces of underground coal mining equipment to ten function categories is provided. Data from 125 full shift time studies contained in the KETRON database was utilized as the primary source data. The KETRON activity and delay codes were mapped onto JPL equipment, personnel and function categories. Computer processing was then performed to aggregate the shift level data and generate the matrices. Additional, documented time study data were analyzed and used to supplement the KETRON databased. The source data including the number of shifts are described. Specific parameters of the mines from which there data were extracted are presented. The result of the data processing including the required JPL matrices is presented. A brief comparison with a time study analysis of continuous mining systems is presented. The procedures used for processing the source data are described. N.W.

N82-16455# Colorado State Univ., Fort Collins. Dept. of Forest and Wood Sciences.
THERMAL VEGETATION CANOPY MODEL STUDIES Final Report, 1 Oct. 1978 - 1 Feb. 1980
James A. Smith, K. Jon Ranson, Duong Nguyen, and Lewis E. Link (Army Engineer Waterways Experiment Station, Vicksburg, Miss.) Aug. 1981 221 p refs
(Contract DACW39-77-C-0073; DA Proj. 4A7-62730-AT-42) (AD-A106422; WES/TR/EL-81-6) Avail: NTIS HC A10/MF A01 CSCL 17/5

This is the final report in a series. Overall objectives of this project are concerned with developing comprehensive optical and thermal signature data bases, the development and evaluation of optical and thermal canopy radiation models, and the interpretation of these measurements. Previous technical reports in this series have described optical and thermal measurements obtained over a coniferous site (Pinus contorta) in Leadville, Colorado. This earlier data set served as a test bed for the development and initial evaluation of first, individual components, that is, needle and leaves, thermal models, and then a composite canopy terrain model. GRA

N82-16456# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MODEL FOR SOLVING MULTIPERIOD MULTIRESERVOIR WATER RESOURCES PROBLEMS WITH STOCHASTIC INFLOWS Ph.D. Thesis - Texas Univ. at Austin
Douglas Dewitt Cochard May 1981 282 p refs
(AD-A106769; AFIT-CI-81-48D) Copyright. Avail: Issuing Activity CSCL 13/2

The model developed solves the multiperiod multireservoir water resources problem with stochastic inflows. Of unique importance is the development of a generalized network model which solves nonlinear nonseparable quadratic problems. Quadratic functions are used to measure the future value of water to the system. The nonseparable form stems from the realization that interaction exists between the benefits to be gained from a multireservoir system. Historically this interactive nature has been ignored due to the computational difficulty of measuring and solving such relationships. Also developed is a stochastic dynamic programming approach which utilizes the results to the network optimization as data for a least squares regression analysis. A quadratic function is fit to this data and is used to represent the future value of water to the system for the next period in the dynamic programming approach. This

functional representation of the future value of water replaces the standard discrete matrix representation of dynamic programming and greatly reduces the dimensionality problems associated with the dynamic programming approach. In the end, this work represents a rare combination of generalized-nonlinear network flow programming, stochastic dynamic programming and regression analysis. GRA

N82-16457# Defense Mapping Agency, Washington, D.C.
THE DEFENSE MAPPING AGENCY'S PILOT DIGITAL OPERATIONS
Bruce K. Opitz, Jerry Becker, and Henry Cook Nov. 1981 20 p
(AD-A108092) Avail: NTIS HC 02/MF A01 CSCL 08/5

The Pilot Digital Operations (PDO) project is an investigation by the Defense Mapping Agency (DMA) into the practicality and utility of computer mapping. PDO is a set of experiments whose results will be used to help in the evaluation of the feasibility and desirability of performing the MC&G production operations in the digital domain. The importance of this effort is based on the nature of future mapping sources, the desire to automate, as much as possible, the production operations and the basic trends of forthcoming technology. The experiments are meant to test available off the shelf technology. By assessing the current state of the art, DMA can determine what areas require further R&D and what are the risks associated with a digital production system. The early experiments test some basic classes of image processing algorithms. The next set test MC&G production functions. This leads to an experiment which involves actually generating a DMA product. Other experiments deal with general design issues emphasizing the human factors and data base aspects of the problems. PDO is scheduled to be completed by the end of 1982. The results to date are discussed and a brief description of the remaining experiments is given.
Author (GRA)

N82-16458# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
CARBON DIOXIDE POWER PLANT FOR TOTAL EMISSION CONTROL AND ENHANCED OIL RECOVERY
Frederick L. Horn and Meyer Steinberg Aug. 1981 28 p refs
(Contract DE-AC02-76CH-00016)
(DE81-030734; BNL-30046) Avail: NTIS HC A03/MF A01

The design of a compact environmentally acceptable carbon dioxide diluted coal-oxygen fired power plant is described. The plant releases no combustion products to the atmosphere. The oxygen for combustion is separated in an air liquefaction plant and the effluent nitrogen is available for use in oil well production. Recycle carbon dioxide mixed with oxygen replaces the nitrogen for the combustion of coal in the burners. The carbon dioxide produced is used in enhanced oil recovery operations and injected into spent wells and excavated salt cavities for long-term storage. The recovery of CO2 from a coal-burning power plant by this method appears to have the lowest energy expenditure and the lowest by-product cost compared to alternative removal and recovery processes. DOE

N82-16459# Los Alamos Scientific Lab., N. Mex.
STUDY OF THE NOCTURNAL DRAINAGE FLOW OVER A SLOPING PLATEAU IN NORTH-CENTRAL NEW MEXICO
Brent M. Bowen, Jean M. Dewart, and Fred G. Fernald 1981 9 p refs Presented at the 2nd AMS Conf. on Mt. Meteorol., Steamboat Springs, Colo., 9-12 Nov. 1981 Sponsored in part by California Univ.
(Contract W-7405-eng-36)
(DE81-028744; LA-UR-81-2121; CONF-811104-6) Avail: NTIS HC A02/MF A01

The drainage winds at Los Alamos are analyzed. Other local winds are discussed: (1) upslope wind, (2) mountain-valley wind, (3) downslope flow due to terrain-forced thunderstorms, and (4) strong nighttime winds due to inversion decoupling. DOE

N82-16460# Los Alamos Scientific Lab., N. Mex.
NOCTURNAL DRAINAGE FLOW OVER COMPLEX TERRAIN USING A GENERALIZED SHALLOW-FLUID APPROXIMATION
B. E. Freeman, S. S. Bunker, and C. G. Davis 1981 5 p refs Presented at the AMS Conf. on Mountain Meteorology, Steamboat Springs, Colo., 10 Nov. 1981
(Contract W-7405-eng-36)
(DE81-028693; LA-UR-81-2087; CONF-811104-7) Avail: NTIS HC A02/MF A01

An approximate formulation of the problem of nocturnal drainage flow was incorporated into a computer code. This formulation representing a generalization of the shallow fluid approximation, is applicable to complex terrain and accounts for many of the salient physical effects exhibited by drainage flow. These include the dynamics of the katabatic flow, radiation cooling, surface drag, entrainment of the overlying layer, the Coriolis force and interaction with the synoptic flow. Example calculations were performed in one and two horizontal dimensions. These calculations exhibit a number of interesting qualitative flow features which have been observed, such as thinning of the layer over ridges and pooling in valleys. Hydraulic jumps in the flow are discussed. The calculation shows qualitatively correct behavior at modest computational cost. Several processes which are represented parametrically can probably be tuned by comparison with data. DOE

N82-16461# Federal Energy Regulatory Commission, Washington, D. C.
WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING: JORDAN RIVER BASIN, UTAH
Aug. 1981 75 p refs
(DE82-000416; FERC-0084) Avail: NTIS HC A04/MF A01

The water resources of the Jordan River Basin which covers approximately 3450 sq.mi. in north central Utah are evaluated. Data are presented on existing and potential water resource development, on water use by existing and proposed steam-electric generating plants, and on the status of hydroelectric power plant licensing. Past and current planning studies are summarized. DOE

N82-16462# Department of Energy, Morgantown, W. Va. Energy Technology Center.
PRELIMINARY RESOURCE ASSESSMENT OF COALBED METHANE IN THE UNITED STATES
Apr. 1981 30 p refs
(DE82-001356; DOE/METC/SP-186) Avail: NTIS HC A03/MF A01

Preliminary results of the DOE Methane Recovery from Coalbeds Project reveal that many of the coal regions in the United States have significant volumes of coalbed methane. These results show that 45 cooperative wells drilled to date have helped to update the estimates of methane in the various coal regions. The most promising coal region is in the Green River Basin where preliminary estimates show that the methane potential may be over 23 trillion cubic feet. Another area of considerable interest is in the Arkoma Basin where the methane content of coal samples ranged from 200 to 400 cubic feet per ton (cf/ton) of coal. The methane estimate in this basin is between 1.6 to 3.6 trillion cubic feet. The Piceance Creek coal region is an area presently generating considerable interest and industry activity. The methane content of the coal samples extracted from this basin averaged over 100 cf/ton. The Northern Appalachian region also shows considerable promise. DOE

N82-16463# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
ENVIRONMENTAL IMPACTS ASSOCIATED WITH USING PEAT FOR ENERGY
R. M. Reed, L. D. Voorhees, and P. J. Mulholland 1981 12 p refs Presented at the Intern. Gas Res. Conf., Los Angeles, 28 Sep. 1981
(Contract W-7405-eng-26)
(DE81-032000; CONF-810909-8; Publ-1795) Avail: NTIS HC A02/MF A01

It is found that the major environmental constraints associated with development of peatlands are related to disruption of important regional wetland ecosystems in terms of ground and surface water hydrology, water and air quality, critical habitats for species of limited distribution, and unique ecosystems that have important scientific and educational values. Development of peat resources for energy can be accomplished in an environmentally acceptable manner but will require detailed

environmental planning and evaluation of these important regional ecosystems. DOE

N82-16464# New Mexico State Univ., Las Cruces. Dept. of Chemical Engineering.
ENHANCED OIL RECOVERY BY CO2 FOAM FLOODING Quarterly Report, 1 Jul. - 30 Sep. 1981
S. Holbrook, Murty Kuntamukkula, John T. Patton, and Ken Spence (Bartlesville Energy Technology Center, Okla.) 30 Sep. 1981 6 p
(Contract DE-AS21-78ET-12083)
(DE82-000949; DOE/MC-12083/14) Avail: NTIS HC A02/MF A01

Progress reports are presented for the following tasks: apparatus design and construction; foam generation and static stability; dynamic foam stability; foam rheology; oil displacement efficiency; mathematical modeling; and final reports. The past quarter was productive with the major effort directed toward bringing the project to a successful completion. All project objectives were met and the results are encouraging with respect to potential commercial applications. DOE

N82-16465# Rensselaer Polytechnic Inst., Troy, N. Y. Office of Contracts and Grants.
EFFECTS OF POROSITY TYPE, PORE GEOMETRY, AND DIAGENETIC HISTORY ON TERTIARY RECOVERY OF PETROLEUM FROM CARBONATE RESERVOIRS Final Report, 1 Jul. 1979 - 30 Nov. 1980
G. M. Friedman, Kenneth Ruzyla, and Anne Reeckmann Sep. 1981 228 p refs
(Contract DE-AC21-79MC-11580)
(DE82-000896; DOE/MC-11580/5) Avail: NTIS HC A11/MF A01

The mechanisms controlling porosity in Red River formation (Upper Ordovician) carbonate reservoirs, were studied in order to determine what types of pore systems result from a given set of depositional and diagenetic conditions. The Red River Formation of Montana is a major oil-producing reservoir in the area and Cabin Creek Field is a good candidate to undergo tertiary recovery in the future. The stratigraphy, distribution of lithofacies, despositional environments, and diagenesis of the study area are discussed. The various types of porosity present, their origin, how they are distributed throughout the upper Red River reservoirs, and how they relate to depositional environment are discussed. Size and shape of pores and pore throats are in terms of statistical measures from capillary-pressure curves, and by interpretation of scanning-electron micrographs of resin-pore casts. Petrophysical relationships, diagenetic controls on the development and geometry of pore systems, and the role of pore geometry in the determination of carbonate reservior characteristics are also addressed. DOE

N82-16466# Geological Survey, Lincoln, Nebr. Water Resources Div.
ANALYSIS OF STREAM-AQUIFER SYSTEM INTER-RELATIONSHIPS IN THE BIG BLUE AND LITTLE BLUE RIVER BASINS IN GAGE AND JEFFERSON COUNTIES, NEBRASKA Final Water-resources Investigation
Michael J. Ellis Jun. 1981 56 p refs Prepared in cooperation with the Kansas-Nebraska Big Blue River Compact Administration, Lincoln, Nebr.
(PB81-245870; USGS/WRD/WRI/81-074; USGS/WRI-81-29) Avail: NTIS HC A04/MF A01 CSCL 08H

Seepage measurements made during the fall of 1978 at 21 sites in the Big Blue River basin and at 35 sites in the Little Blue River basin were used to determine stream gains or losses in 20 drainage areas in the Big Blue River basin and 31 drainage areas in the Little Blue River basin. Analyses of data from these seepage measurements and of available hydrogeologic data indicate that the most significant ground-water contributions to streamflow in the Big Blue and Little Blue River drainage basins in Gage and Jefferson Counties, NE., occur where a direct hydraulic connection exists between a stream and buried coarse-grained deposits of Quaternary age. These deposits occur in two buried bedrock valleys that trend east-northeasterly across the area. GRA

N82-16467# Department of Agriculture, Washington, D.C. Natural Resource Economics Div.
IMPLICATIONS OF LAND, WATER AND ENERGY RESOURCE POLICIES ON AGRICULTURAL PRODUCTION
Klaus Alt, Norman Landgren, Richard Clark, Veral Benson, and William Anderson May 1981 96 p refs
(PB81-244063; AGESS-810513) Avail: NTIS HC A05/MF A01 CSCL 02A

The nature and potential impact of several natural resource and environmental policies on the use of land and water in agricultural production are discussed. The land control policies considered are those which may cause the owners to change land use to reduce soil erosion, to decrease wetland drainage and to preserve prime farmland in agriculture. Water policies are considered which related to the preservation of minimum in stream water flows, increasing the efficiency of irrigation, and meeting competition for water from energy production. DOE

N82-16468# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
THE APRAC-3/MOBILE 1 EMISSIONS AND DIFFUSION MODELING PACKAGE: USER'S MANUAL Final Report
P. B. Simmon, R. M. Patterson, F. L. Ludwig, and L. B. Jones Jul. 1981 333 p refs
(Contract EPA-68-02-2548; SRI Proj. 8955)
(PB82-103763; EPA-909/9-81-002) Avail: NTIS HC A07/MF A01 CSCL 13B

Instructions on the use and applicability of the APRAC3/MOBILE1 emissions and diffusion model are presented in this manual. The previous version of the model, APRAC-2, completely revised the methodology of the original model, APRAC-1A. The latest version of the model remains basically the same as APRAC-2 with the exception of two important modifications. First, the emission factor computation methodology has been revised to reflect the EPA's latest update, and the portion of the code that performs those computations has been separated from the model's emission rate and diffusion modules to facilitate incorporation of future emission factor methodology updates. The second modification to the model will increase computation efficiency by automatically treating traffic links in the primary network with low vehicle miles of travel (VMT) as area sources. This will allow the remaining primary link file to fit into core storage rather than incurring the numerous and expensive input/output operations necessary when the primary traffic file is large. GRA

N82-16469# Illinois State Water Survey, Champaign.
ADEQUACY AND ECONOMICS OF WATER SUPPLY IN NORTHEASTERN ILLINOIS, 1985 - 2010
Krishan P. Singh and J. Rodger Adams 1980 212 p refs
(PB82-105495; ISWS/RI-97/80) Avail: NTIS HC A10/MF A01 CSCL 13B

Plans were developed for optimal use of available groundwater and surface water resources for adequate and dependable water supply to all towns in Cook, DuPage, Kane, Lake, McHenery, and Will Counties in Illinois. An effective water-demand model, based on a town's population and industrial employment, was used for future demand projections. The potential yield of sand and gravel and Silurian dolomite aquifers was investigated. Cost functions were developed in terms of July 1980 dollars for wells, pumps, water conveyance system components, reservoirs, and treatment plants. GRA

N82-16470# Little (Arthur D.), Inc., Cambridge, Mass.
DEVELOPMENT OF A THROUGH-THE-EARTH MONITOR SYSTEM Final Open File Report, Oct. 1977 - Dec. 1980
Dec. 1980 32 p refs
(Contract DI-BM-HO-177098)
(PB81-237646; BM-OFR-99-81) Avail: NTIS HC A03/MF A01 CSCL 08I

The system developed uses the mine pager phone line as the primary communication channel and also has the capability of using 208 Hz in the ELF band for wireless transmission through the Earth. The depth for through-the-Earth transmission is expected to be about 80 to 90 meters in high conductivity soil and is limited by the noise level in the ELF band-pass filters. The underground components of the TEM System are energized by mine power through a battery charger-storage battery power

supply. In the event of mine power failure the battery capacity is more than sufficient for 1 week's operation with interrogations every 4 hours. GRA

N82-16471# Ohio State Univ., Columbus. Water Resources Center.
THE SOURCE AND TRANSPORT OF ARSENIC IN NORTHEASTERN OHIO GROUNDWATERS
Gerald Matisoff, Christopher J. Khourey, and John F. Hall 1981 75 p refs Prepared in cooperation with Case Western Reserve Univ.
(PB81-240525; W81-04658; OWRT-A-061-OHIO(1)) Avail: NTIS HC A04/MF A01 CSCL 08H

Groundwaters in the Northwest School System area of Canal Fulton, Ohio were examined for their hydrologic and chemical properties. In general, the groundwaters were interconnected by a complex system of aquifer and aquitards. Arsenic concentrations were above EPA limits in two wells, but were elevated above the background value throughout much of the area. Theoretical and laboratory studies of arsenic in these groundwaters demonstrates that it is entirely of inorganic make-up, and consists of about equal parts of arsenate and arsenite. Redox considerations suggest that arsenic is controlled by an adsorption equilibrium with ferric hydroxides, and that the reduction of the ferric hydroxides by a recent lowering of Eh and/or pH in the aquifier has liberated both iron and arsenic to solution. GRA

N82-16472# Terra Tek, Inc., Salt Lake City, Utah. Drilling Research Lab.
SMALL BUSINESS INNOVATION RESEARCH: OIL RECOVERY ENHANCEMENT BY ACOUSTIC MEANS Final Report
Ahmed S. Abou-Sayed, George J. Dvorak, Sidney J. Green, Arion H. Jones, Richard Lingle, and Joseph B. Walsh Feb. 1981 47 p refs
(Grant NSF DAR-79-17712)
(PB81-243842; NSF/IST-81001) Avail: NTIS HC A03/MF A01 CSCL 09I

The effect of a stress wave pulse on a porous saturated rock was studied. Three different situations were analyzed: The presence of a linear viscoelastic (Newtonian) fluid in the pore space; the presence of a nonlinear (non-Newtonian) fluid in the pore space without a pore filled pressure gradient, i.e., fluid flow; and the presence of a nonlinear (non-Newtonian) fluid in the pore space with a pore fluid pressure gradient, i.e., fluid flow. It was found that there can be no pumping action with a periodic stress wave in a system containing a linear, Newtonian fluid for stress pulses in the low frequency range. Pumping will occur for frequencies above about 1,000 cycles per second for the material and pore spacing considered in the study typical of some rocks. GRA

N82-16473# Geological Survey, St. Paul, Minn.
HYDROGEOLOGIC SETTING OF THE GLACIAL LAKE AGASSIZ PEATLANDS, NORTHERN MINNESOTA
D. I. Siegel Jul. 1981 36 p refs Prepared in cooperation with Dept. of Natural Resources, St. Paul, Minn., and EPA, Washington, D.C.
(PB81-249328; USGS/WRI-81-24; USGS/WRD/WRI/81-077) Avail: NTIS HC A03/MF A01 CSCL 08H

Seven test holes drilled in the Glacial Lake Agassiz Peatlands indicate that the thickness of surficial materials along a north-south traverse parallel to Minnesota Highway 72 ranges from 163 feet near Blackduck, Minnesota to 57 feet about 3 miles south of Upper Red Lake. Lenses of sand and gravel occur immediately above bedrock on the Itasca moraine and are interbedded with lake clay and till under the peatlands. Vertical head gradients measured in a piezometer nest near Blackduck on the moraine are downward, indicative of recharge to the regional ground-water-flow system. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-16474* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTI-CHANNEL TEMPERATURE MEASUREMENT AMPLIFICATION SYSTEM Patent
James R. Currie, inventor (to NASA) Issued 11 Aug. 1981 8 p Filed 29 Nov. 1979 Supersedes N80-17421 (18 - 08, p 1006)
(NASA-Case-MFS-23775-1; US-Patent-4,282,752; US-Patent-Appl-SN-098569; US-Patent-Class-73-341) Avail: US Patent and Trademark Office CSCL 10C

A number of differential outputs of thermocouples are sequentially amplified by a common amplifier. The amplified outputs are compared with a reference temperature signal in an offset correction amplifier, and a particularly poled output signal is provided when a differential output is of a discrete level compared with a reference temperature signal.
Official Gazette of the U.S. Patent and Trademark Office

N82-16475* National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR HEATED FLUIDIZED BED GASIFICATION SYSTEM Patent
Shaik A. Qader, inventor (to NASA) (JPL, California Inst. of Technology Pasadena) Issued 22 Sep. 1981 5 p Filed 15 May 1980 Supersedes N80-24747 (18 - 15, p 2002) Sponsored by NASA
(NASA-Case-NPO-15071-1; US-Patent-4,290,779; US-Patent-Appl-SN-150115; US-Patent-Class-48-89; US-Patent-Class-48-99; US-Patent-Class-126-438; US-Patent-Class-250-527) Avail: US Patent and Trademark Office CSCL 10A

A solar-powered fluidized bed gasification system for gasifying carbonaceous material is presented. The system includes a solar gasifier which is heated by fluidizing gas and steam. Energy to heat the gas and steam is supplied by a high heat capacity refractory honeycomb which surrounds the fluid bed reactor zone. The high heat capacity refractory honeycomb is heated by solar energy focused on the honeycomb by solar concentrator through solar window. The fluid bed reaction zone is also heated directly and uniformly by thermal contact of the high heat capacity ceramic honeycomb with the walls of the fluidized bed reactor. Provisions are also made for recovering and recycling catalysts used in the gasification process. Back-up furnace is provided for start-up procedures and for supplying heat to the fluid bed reaction zone when adequate supplies of solar energy are not available.
Official Gazette of the U.S. Patent and Trademark Office

N82-16476# Technische Hogeschool, Delft (Netherlands).
INDOOR CLIMATE, OUTDOOR CLIMATE AND ENERGY CONSUMPTION: A NEW APPROACH TO THE CALCULATION OF THE EFFECT OF THE OUTDOOR AND INDOOR CLIMATE ON THE ENERGY CONSUMPTION IN BUILDINGS BASED ON METHODS OF STATISTICAL ANALYSIS
Adolph Hendricus Cornelis vanPaassen 22 Oct. 1981 131 p refs
Avail: NTIS HC A07/MF A01

The calculation efficiency of the yearly energy consumption of HVAC systems by improving the calculation method and by developing compact models of the building's thermal behavior and of the outdoor climate. Emphasis is on modeling the outdoor climate. The thermal behavior of the building is the combined effect of the solar radiation, the outdoor temperature, the energy sources and sinks within the building and the thermal behavior of the structure. It is characterized with the response factor method. With this method an excitation variable (for example

the solar radiation) and the variable of interest (the indoor temperature or the cooling load) are related by a series of response factors. An experimental validation is given based on measurements of the indoor- and outdoor climate of a specific room in an excisting building. Also measurements are done on a 'climate room', which is specially designed to check these response factors. T.M.

N82-16477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW FEATURES AND APPLICATIONS OF PRESTO, A COMPUTER CODE FOR THE PERFORMANCE OF REGENERATIVE, SUPERHEATED STEAM TURBINE CYCLES

Yung K. Choo and Peter J. Staiger Jan. 1982 39 p refs

(NASA-TP-1954; E-721) Avail: NTIS HC A03/MF A01 CSCL 10B

The code was designed to analyze performance at valves-wide-open design flow. The code can model conventional steam cycles as well as cycles that include such special features as process steam extraction and induction and feedwater heating by external heat sources. Convenience features and extensions to the special features were incorporated into the PRESTO code. The features are described, and detailed examples illustrating the use of both the original and the special features are given. T.M.

N82-16478*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VARIABLE GAIN FOR A WIND TURBINE PITCH CONTROL Final Report

Robert C. Seidel and Arthur G. Birchenough Dec. 1981 14 p refs

(Contract DE-AI01-76ET-20320)

(NASA-TM-82751; DOE/NASA/20320-34; E-1067) Avail: NTIS HC A02/MF A01 CSCL 10A

The gain variation is made in the software logic of the pitch angle controller. The gain level is changed depending upon the level of power error. The control uses low gain for low pitch activity the majority of the time. If the power exceeds ten percent offset above rated, the gain is increased to a higher gain to more effectively limit power. A variable gain control functioned well in tests on the Mod-0 wind turbine. T.M.

N82-16479*# New Mexico Univ., Albuquerque. Dept. of Electrical and Computer Engineering.

STUDY OF THE PHOTOVOLTAIC EFFECT IN THIN FILM BARIUM TITANATE Annual Report

W. W. Grannemann and Vineet S. Dharmadhikari Jan. 1982 24 p

(Grant NAG1-95)

(NASA-CR-165081; EE-273(82)NASA-931-1) Avail: NTIS HC A02/MF A01 CSCL 10A

Ferroelectric films of barium titanate were synthesized on silicon and quartz substrates, and the photoelectric effect in the structure consisting of metal deposited ferroelectric barium titanate film silicon was studied. A photovoltage with polarity that depends on the direction of the remanent polarization was observed. The deposition of BaTiO3 on silicon and fused quartz substrates was accomplished by an RF sputtering technique. A series of experiments to study the growth of ferroelectric BaTiO3 films on single crystal silicon and fused quartz substrates were conducted. The ferroelectric character in these films was found on the basis of evidence from the polarization electric field hysteresis loops, capacitance voltage and capacitance temperature techniques and from X-ray diffraction studies. S.L.

N82-16480*# Engelhard Industries, Inc., Edison, N.J.

DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Progress Report, Feb. - Apr. 1981

24 Jun. 1981 51 p

(Contracts DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-165328; DOE/NASA/0241-1; QR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

Progress toward an integrated 5kW power system based upon methanol fuel and a phosphoric acid fuel cell operating at about 473 K is described in detail. Description includes test results of advanced fuel cell catalysts, a semi-automatic acid replenishment system and a completed 5kW methanol/steam reformer. Design features of a 5kW fuel cell stack are included. The results of a preliminary system test on a reformer/stack/inverter combination are reported. An initial design for a 25 kW stack is presented. Experimental plans are outlined for data acquisition necessary for design of a 50 kW methanol/steam reformer. Activities related to complete mathematical modelling of the integrated power system, including wasteheat utilization are described. T.M.

N82-16481*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SUMMARY AND EVALUATION OF THE CONCEPTUAL DESIGN STUDY OF A POTENTIAL EARLY COMMERCIAL MHD POWER PLANT (CSPEC) Final Report

P. J. Staiger and P. F. Penko Jan. 1982 22 p refs

(Contract DE-AI01-77ET-10769)

(NASA-TM-82734; DOE/NASA/10769-21; E-1046) Avail: NTIS HC A02/MF A01 CSCL 10B

The conceptual design study of a potential early commercial MHD power plant (CSPEC) is described and the results are summarized. Each of two contractors did a conceptual design of an approximately 1000 MWe open-cycle MHD/steam plant with oxygen enriched combustion air preheated to an intermediate temperature in a metallic heat exchanger. The contractors were close in their overall plant efficiency estimates but differed in their capital cost and cost of electricity estimates, primarily because of differences in balance-of-plant material, contingency, and operating and maintenance cost estimates. One contractor concluded that its MHD plant design compared favorably in cost of electricity with conventional coal-fired steam plants. The other contractor is making such a comparison as part of a follow-on study. Each contractor did a preliminary investigation of part-load performance and plant availability. The results of NASA studies investigating the effect of plant size and oxidizer preheat temperature on the performance of CSPEC-type MHD plants are also described. The efficiency of a 1000 MWe plant is about three points higher than of a 200 MWe plant. Preheating to 1600 F gives an efficiency about one and one-half points higher than preheating to 800 F for all plant sizes. For each plant size and preheat temperature there is an oxidizer enrichment level and MHD generator length that gives the highest plant efficiency. B.W.

N82-16482*# Energy Research Corp., Danbury, Conn.

TECHNOLOGY DEVELOPMENT FOR PHOSPHORIC ACID FUEL CELL POWERPLANT, PHASE 2 Final Technical Report

Larry Christner Dec. 1981 159 p refs

(Contracts DEN3-67; DE-AI03-79ET-11272)

(NASA-CR-165426; DOE/NASA/0067-79/7) Avail: NTIS HC A08/MF A01 CSCL 10A

The development of materials, cell components, and reformers for on site integrated energy systems is described. Progress includes: (1) heat-treatment of 25 sq cm, 350 sq cm and 1200 sq cm cell test hardware was accomplished. Performance of fuel cells is improved by using this material; (2) electrochemical and chemical corrosion rates of heat-treated and as-molded graphite/phenolic resin composites in phosphoric acid were determined; (3) three cell, 5 in. x 15 in. stacks operated for up to 10,000 hours and 12 in. x 17 in. five cell stacks were tested for 5,000 hours; (4) a three cell 5 in. x 15 in. stack with 0.12 mg Pt/sq cm anodes and 0.25 mg Pt/sq cm cathodes was operated for 4,500 hours; and (5) an ERC proprietary high bubble pressure matrix, MAT-1, was tested for up to 10,000 hours. A.R.H.

N82-16483*# Engelhard Industries, Inc., Edison, N.J. Industries Div.

DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, May - Jul. 1981

25 Aug. 1981 35 p refs

(Contracts DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-165455; DOE/NASA/0241-2; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10B

A schematic and physical layout is given for the 5kW

integrated system and the development status of individual components is described. The results of using a one dimensional mathematical model of the 5kW reformer are presented. Plans for a single-tube reformer test unit for the acquisition of temperature profile data are described. Tentative specifications for a 50kW dc-to-ac inverter are listed. Performance data are given on two 3-cell stacks incorporating semiautomatic acid replenishment systems and improved electrocatalysts. A qualification test on methanol/steam reforming catalyst T2107RS is reported, including a portion in which the catalyst was deliberately poisoned with 800 ppm ethanol in the feed. Author

N82-16484*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

DEMONSTRATION OF CATALYTIC COMBUSTION WITH RESIDUAL FUEL Final Report

W. J. Dodds and E. E. Ekstedt Aug. 1981 106 p refs

(Contracts DEN3-155; DE-A101-77ET-10350)

(NASA-CR-165369; DOE/NASA/0155-1; R81AEG590) Avail: NTIS HC A06/MF A01 CSCL 10B

An experimental program was conducted to demonstrate catalytic combustion of a residual fuel oil. Three catalytic reactors, including a baseline configuration and two backup configurations based on baseline test results, were operated on No. 6 fuel oil. All reactors were multielement configurations consisting of ceramic honeycomb catalyzed with palladium on stabilized alumina. Stable operation on residual oil was demonstrated with the baseline configuration at a reactor inlet temperature of about 825 K (1025 F). At low inlet temperature, operation was precluded by apparent plugging of the catalytic reactor with residual oil. Reduced plugging tendency was demonstrated in the backup reactors by increasing the size of the catalyst channels at the reactor inlet, but plugging still occurred at inlet temperature below 725 K (845 F). Operation at the original design inlet temperature of 589 K (600 F) could not be demonstrated. Combustion efficiency above 99.5% was obtained with less than 5% reactor pressure drop. Thermally formed NO sub x levels were very low (less than 0.5 g NO2/kg fuel) but nearly 100% conversion of fuel-bound nitrogen to NO sub x was observed. M.D.K.

N82-16485*# Ford Motor Co., Dearborn, Mich.

ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM INITIAL DEVELOPMENT REPORT Progress Report, 20 May - 24 Sep. 1979

Aug. 1980 150 p Prepared in cooperation with AiResearch Mfg. Co., Phoenix, Ariz.

(Contract DEN3-37)

(NASA-CR-165130; DOE/NASA/0037-80/2; DDA-ADR-10086) Avail: NTIS HC A07/MF A01 CSCL 10B

The powertrain consists of a single shaft regenerated gas turbine engine utilizing ceramic hot section components, coupled to a slit differential gearbox with an available variable stator torque converter and an available Ford intergral overdrive four-speed automatic transmission. Predicted fuel economy using gasoline fuel over the combined federal driving cycle (CFDC) is 15.3 km/1, which represents a 59% improvement over the spark-ignition-powered baseline vehicle. Using DF2 fuel, CFDC mileage estimates are 17.43 km/1. Zero to 96.6 km/hr acceleration time is 11.9 seconds with a four-second acclera-tion distance of 21.0 m. The ceramic radial turbine rotor is discussed along with the control system for the powertrain. T.M.

N82-16486*# Texas Research and Engineering Inst., Inc., Port Neches.

SILICON PRODUCTION PROCESS EVALUATIONS Quarterly Technical Progress Report, 1 Aug. - 31 Oct. 1981

Dec. 1981 18 p refs Prepared for JPL

(Contract JPL-956045)

(NASA-CR-163470; DOE/JPL-956045-81/2; JPL-9950-621; QTPR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

Chemical engineering analysis of the HSC process (Hemlock Semiconductor Corporation) for producing silicon from di-chlorosilane in a 1,000 MT/yr plant was continued. Progress and status for the chemical engineering analysis of the HSC process are reported for the primary process design engineering activities: base case conditions (85%), reaction chemistry (85%), process flow diagram (60%), material balance (60%), energy balance (30%), property data (30%), equipment design (20%) and major equipment list (10%). Engineering design of the initial distillation column (D-01, stripper column) in the process was initiated. The function of the distillation column is to remove volatile gases (such as hydrogen and nitrogen) which are dissolved in liquid chlorosilanes. Initial specifications and results for the distillation column design are reported including the variation of tray requirements (equilibrium stages) with reflux ratio for the distillation. T.M.

N82-16487*# Honeywell Corporate Material Sciences Center, Bloomington, Minn.

SILICON-ON CERAMIC PROCESS: SILICON SHEET GROWTH AND DEVICE DEVELOPMENT FOR THE LARGE-AREA SILICON SHEET TASK OF THE LOW-COST SOLAR ARRAY PROJECT Final Report

B. L. Grung, J. D. Heaps, F. M. Schmit, S. B. Schuldt, and J. D. Zook 3 Mar. 1981 239 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-954356)

(NASA-CR-163476; DOE/JPL-954356-80/15; JPL-9950-617) Avail: NTIS HC A11/MF A01 CSCL 10A

The technical feasibility of producing solar-cell-quality sheet silicon to meet the Department of Energy (DOE) 1986 overall price goal of $0.70/watt was investigated. With the silicon-on-ceramic (SOC) approach, a low-cost ceramic substrate is coated with large-grain polycrystalline silicon by unidirectional solidifica-tion of molten silicon. This effort was divided into several areas of investigation in order to most efficiently meet the goals of the program. These areas include: (1) dip-coating; (2) continuous coating designated SCIM-coating, and acronym for Silicon Coating by an Inverted Meniscus (SCIM); (3) material characterization; (4) cell fabrication and evaluation; and (5) theoretical analysis. Both coating approaches were successful in producing thin layers of large grain, solar-cell-quality silicon. The dip-coating approach was initially investigated and considerable effort was given to this technique. The SCIM technique was adopted because of its scale-up potential and its capability to produce more conventiently large areas of SOC. N.W.

N82-16488*# Hemlock Semiconductor Corp., Mich.

DEVELOPMENT OF A POLYSILICON PROCESS BASED ON CHEMICAL VAPOR DEPOSITION (PHASE 1) Quarterly Progress Report, 1 Jan. - 31 Mar. 1981

J. McCormick, A. Arvidson, D. Sawyer, and F. Plahutnik Jun. 1981 51 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955533)

(NASA-CR-163475; DOE/JPL-955533-81/6; JPL-9950-618; QPR-6) Avail: NTIS HC A04/MF A01 CSCL 10A

A dichlorosilane-based reductive chemical vapor deposition (CVD) process demonstrated is capable of producing, at low cost, high quality polycrystalline silicon. Testing of decomposition reactor heat shields to insure that the shield provides adequate personnel protection assuming a worst case explosion was completed. Minor modifications to a production reactor heat shield provided adequate heat shield integrity. Construction of the redesigned PDU (Process Development Unit) to accommodate all safety related information proceeded on schedule. Structural steel work was completed as is the piping and instrumentation design work. Major pieces of process equipment were received and positioned in the support structure and all transfer piping and conduits to the PDU were installed. Construction was completed on a feed system for supplying DCS to an intermediate sized reactor. The feed system was successfully interfaced with a reactor equipped with a modified heat shield. Reactor checkout was completed. Author

N82-16489*# Texas Univ. at Arlington. Center for Electrome-chanics.

A STUDY PERTAINING TO INERTIAL ENERGY STORAGE MACHINE DESIGNS FOR SPACE APPLICATIONS Final Report

Raymond C. Zowarka Aug. 1981 68 p refs Prepared for JPL

(Contract JPL-955969)

(NASA-CR-163465) Avail: NTIS HC A04/MF A01 CSCL 10C

The preliminary design of a counterrotating fast discharge

homopolar generator (HPG) and a counterrotating active rotary flux compressor (CARFC) for space application is reported. The HPG is a counterrotating spool-type homopolar with superconducting field coil excitation. It delivers a 20-ms, 145-kJ pulse to a magnetoplasmahydrodynamic thruster. The peak output current is 42.7 kA at 240 V. After 20 ms the current is 29.7 kA at 167 V. The CARFC delivers ten 50-kJ, 250 microsecond pulses at 50-ms interval to six Xenon flash lamps pumping an Nd glass laser. The flux compressor is counterrotating for torque compensation. Current is started in the machine with a 5-kV, 5-kJ pulse-charged capacitor. Both designs were based upon demonstrated technology. The sensitivity of the designs to technology that may be available in five to ten years was determined. Author

N82-16490*# Spire Corp., Bedford, Mass.
DEVELOPMENT AND FABRICATION OF A SOLAR CELL JUNCTION PROCESSING SYSTEM
S. Bunker Oct. 1981 30 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-955640)
(NASA-CR-163474; DOE/JPL-955640-81/7; JPL-9950-623; QR-10073-07; QR-7) Avail: NTIS HC A03/MF A01 CSCL 10A

A solar cell junction processing system was developed and fabricated. A pulsed electron beam for the four inch wafers is being assembled and tested, wafers were successfully pulsed, and solar cells fabricated. Assembly of the transport locks is completed. The transport was operated successfully but not with sufficient reproducibility. An experiment test facility to examine potential scaleup problems associated with the proposed ion implanter design was constructed and operated. Cells were implanted and found to have efficiency identical to the normal Spire implant process. S.L.

N82-16491*# Motorola, Inc., Phoenix, Ariz. Semiconductor Group.
PROCESSING EXPERIMENTS ON NON-CZOCHRALSKI SILICON SHEET Final Report
R. A. Pryor, L. A. Grenon, N. G. Sakiotis, E. M. Pastirik, T. O. Sparks, and R. N. Legge Apr. 1981 221 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955844)
(NASA-CR-163473; DOE/JPL-955844-81/2; JPL-9950-624) Avail: NTIS HC A10/MF A01 CSCL 10A

A program is described which supports and promotes the development of processing techniques which may be successfully and cost-effectively applied to low-cost sheets for solar cell fabrication. Results are reported in the areas of process technology, cell design, cell metallization, and production cost simulation. T.M.

N82-16492*# Boeing Engineering and Construction, Seattle, Wash. Solar Systems Group.
A CONCEPTUAL DESIGN STUDY OF POINT FOCUSING THIN-FILM SOLAR CONCENTRATORS Final Report
11 Nov. 1981 128 p refs Prepared for JPL
(Contract JPL-955804)
(NASA-CR-163472; JPL-9950-625) Avail: NTIS HC A07/MF A01 CSCL 10A

Candidates for reflector panel design concepts, including materials and configurations, were identified. The large list of candidates was screened and reduced to the five most promising ones. Cost and technical factors were used in making the final choices for the panel conceptual design, which was a stiffened steel skin substrate with a bonded, acrylic overcoated, aluminized polyester film reflective surface. Computer simulations were run for the concentrator optics using the selected panel design, and experimentally determined specularity and reflectivity values. Intercept factor curves and energy to the aperture curves were produced. These curves indicate that surface errors of 2 mrad (milliradians) or less would be required to capture the desired energy for a Brayton cycle 816 C case. Two test panels were fabricated to demonstrate manufacturability and optically tested for surface error. Surface errors in the range of 1.75 mrad and 2.2 mrad were measured. T.M.

N82-16493*# Astro Research Corp., Carpinteria, Calif.
EFFICIENT STRUCTURES FOR GEOSYNCHRONOUS SPACECRAFT SOLAR ARRAYS. PHASE 1, 2 AND 3 Final Report
Louis R. Adams and John M. Hedgepeth 14 Sep. 1981 102 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955647)
(NASA-CR-163471; ARC-TN-1098; JPL-9950-626) Avail: NTIS HC A06/MF A01 CSCL 10A

Structural concepts for deploying and supporting lightweight solar-array blankets for geosynchronous electrical power are evaluated. It is recommended that the STACBEAM solar-array system should be the object of further study and detailed evaluation. The STACBEAM system provides high stiffness at low mass, and with the use of a low mass deployment mechanism, full structural properties can be maintained throughout deployment. The stowed volume of the STACBEAM is acceptably small, and its linear deployment characteristic allows periodic attachments to the solar-array blanket to be established in the stowed configuration and maintained during deployment. N.W.

N82-16494*# IIT Research Inst., Chicago, Ill.
INTERNATIONAL MARKET ASSESSMENT OF STAND-ALONE PHOTOVOLTAIC POWER SYSTEMS FOR COTTAGE INDUSTRY APPLICATIONS Final Report
Therese M. Philippi Nov. 1981 290 p refs
(Contracts DEN3-197; DE-AI01-79ET-20485)
(NASA-CR-165287; DOE/NASA/0197-1; IITRI-J06519) Avail: NTIS HC A13/MF A01 CSCL 10B

The final result of an international assessment of the market for stand-alone photovoltaic systems in cottage industry applications is reported. Nonindustrialized countries without centrally planned economies were considered. Cottage industries were defined as small rural manufacturers, employing less than 50 people, producing consumer and simple products. The data to support this analysis were obtained from secondary and expert sources in the U.S. and in-country field investigations of the Philippines and Mexico. The near-term market for photovoltaics for rural cottage industry applications appears to be limited to demonstration projects and pilot programs, based on an in-depth study of the nature of cottage industry, its role in the rural economy, the electric energy requirements of cottage industry, and a financial analysis of stand-alone photovoltaic systems as compared to their most viable competitor, diesel driven generators. Photovoltaics are shown to be a better long-term option only for very low power requirements. Some of these uses would include clay mixers, grinders, centrifuges, lathes, power saws and lighting of a workshop. Author

N82-16495*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE NASA LEWIS LARGE WIND TURBINE PROGRAM
R. L. Thomas and D. H. Baldwin 1981 24 p refs Presented at the 5th Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5-7 Oct. 1981
(Contract DE-AI01-79ET-20305)
(NASA-TM-82761; DOE/NASA/20305-7; E-1082) Avail: NTIS HC A01/MF A01 CSCL 10B

The program is directed toward development of the technology for safe, reliable, environmentally acceptable large wind turbines that have the potential to generate a significant amount of electricity at costs competitive with conventional electric generation systems. In addition, these large wind turbines must be fully compatible with electric utility operations and interface requirements. Advances are made by gaining a better understanding of the system design drivers, improvements in the analytical design tools, verification of design methods with operating field data, and the incorporation of new technology and innovative designs. An overview of the program activities is presented and includes results from the first and second generation field machines (Mod-OA, -1, and -2), the design phase of the third generation wind turbine (Mod-5) and the advanced technology projects. Also included is the status of the Department of Interior WTS-4 machine. T.M.

N82-16496# Technische Hogeschool, Delft (Netherlands). Dept. of Urban and Regional Planning.
WIND ENERGY PLANNING CONSIDERATIONS [WINDEN-

ERGIE IN PLANOGISCH PERSPEKTIEF]
A. vanSetten and H. Voogd Apr. 1980 19 p refs In DUTCH Presented at Planning Conf., Amsterdam, Apr. 1980
(PM-80-4) Avail: NTIS HC A02/MF A01

Windpowered utilization in the Netherlands and the search for wind rich areas is discussed. It is suggested that large water areas, like the North Sea and Market Lake, are the preferred areas for wind powered energy production. Storage of wind energy in large water basins is suggested. Government wind energy production programs like the installation of wind parks, and difficulties because of opposing local interests are discussed. Windmill exploration by small private industry, rather than by government administered programs, are outlined. E.A.K.

N82-16497# Eagle-Picher Industries, Inc., Joplin, Mo. Electronics Div.
CALCIUM INORGANIC ELECTROLYTE BATTERY DEVELOPMENT Final Report, Aug. 1977 - Oct. 1980
R. L. Higgins Wright-Patterson AFB, Ohio AFWAL Aug. 1981 82 p refs
(Contract F33615-77-C-2020; AF Proj. 3145)
(AD-A106199; AFWAL-TR-81-2064) Avail: NTIS HC A05/MF A01 CSCL 10/3

Further development of Ca/SOC12 was studied. The use of lithium (Li) anodes with thionyl chloride (SOC12) was investigated advancing from laboratory cells to a viable 400-600 WH/Kg system demonstrated in cell sizes up to 17000 AH. Performance improvements were made, espcially in problems such as voltage delay due to anode passivation. Response to abuse of Li/SOC12 cells primarily results from the reactivity of molten Li, a problem compounded by its low melting point of 180 C. It is assumed that most Group I and II metals are highly reactive in the molten state and the problems might be reduced by using materials with higher melting points. Several Group I and II elements have energy densities near that of Li, such as Na, Ca and Mg; of these three however, only Ca and Mg have acceptable melting points. Ca, though lower in energy density than Mg, is capable of 5.93 WH/cc, has a working voltage of approximately 3.0V, and has a higher melting point than Mg. E.A.K.

N82-16498# Mid-American Solar Energy Complex, Minneapolis, Minn.
PASSIVE-SOLAR RETROFIT CONCEPTS
Sep. 1981 49 p
(Contract DE-AC02-79CS-30150)
(DE82-000453; MASEC-PA-81-030) Avail: NTIS HC A03/MF A01

Four retrofit passive solar designs for single family dwellings are presented. The first design, for a house in Minnesota, involves insulating wall cavities and the attic with blown cellulose, reduction of infiltration, and installation of insulating shades on all windows. The second, for a house in Michigan, combines weatherization, a sunspace with clerestory, and a thermosiphoning collector. The third, for a house in Missouri, involves the addition of a large sunspace with a passive solar hot water preheater for a hot tub. The fourth, for a house in Indiana, combines intensive weatherization with a two story sunspace and thermal chimney addition. All designs are thoroughly illustrated. DOE

N82-16499# Mid-American Solar Energy Complex, Minneapolis, Minn.
PASSIVE-SOLAR MULTI-FAMILY CONCEPTS
Aug. 1981 88 p
(Contract DE-AC02-79CS-30150)
(DE82-000456; MASEC-PA-81-033) Avail: NTIS HC A05/MF A01

The potential for saving energy and money through the use of passive solar techniques in multi family buildings is examined. Seven designs for passive solar apartment/townhouse buildings are presented. Each design is described and illustrated. The buildings are sited in Indiana, Michigan, Missouri, Ohio, South Dakota, and Minnesota. DOE

N82-16500# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SIMPLE PREDICTIVE MODEL FOR PERFORMANCE OF DESICCANT BEDS FOR SOLAR DEHUMIDIFICATION
Robert S. Barlow Aug. 1981 7 p refs Presented at the Intern. Passive and Hybrid Cooling Conf., Miami Beach, Fla., 11-13 Nov. 1981; sponsored by the America Section of the International Solar Energy Society
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-023606; SERI/TP-631-1329; CONF-811109-1) Avail: NTIS HC A02/MF A01

A computer model for the absorption/desorption process that predicts the performance of desiccant beds for solar regenerated dehumidification of passively cooled buildings is outlined. The model uses simple algebraic equations for steady state heat and mass exchangers. The validity and accuracy of the model is demonstrated. The physics of the adsorption process in two psychrometric process lines is discussed. DOE

N82-16501# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
CASE STUDIES OF LOW-TO-MODERATE TEMPERATURE HYDROTHERMAL ENERGY DEVELOPMENT
Oct. 1981 126 p refs Prepared in cooperation with California Univ., Lawrence Berkeley Lab.
(Contract DE-AC07-76ID-01570)
(DE82-000883; IDO-10098) Avail: NTIS HC A07/MF A01

Six development projects that use low to moderate temperature geothermal resources were examined. The projects illustrate many facets of hydrothermal development. The history of this development, its exploratory methods, and its resource definition, are described and address legal, environmental, and institutional constraints. DOE

N82-16502# Los Alamos Scientific Lab., N. Mex.
ALTERNATE THERMOCHEMICAL CYCLES
Charles M. Hollabaugh, Melvin G. Bowman, and Charles L. Peterson 1981 6 p refs Presented at Ann. Contractors' Rev. Meeting on Thermal and Chem. Storage, Tysons Corners, Va., 14-16 Sep. 1981 Submitted for publication
(DE81-030248; LA-UR-81-2513; CONF-810940-5) Avail: NTIS HC A02/MF A01

Experimental verification of all steps in the bismuth sulfate cycle was obtained. At acid concentrations greater than 52.7 wt percent, normal Bi2(SO4)3 is formed but at lower concentrations, greater than 3.0 wt percent, the bismuth oxysulfate, BiO(SO4)2, is formed. Upon heating to temperatures in the range of 975 to 1150 K, both decompose by the loss of SO3 to a final composition of Bi2O2 3(SO4)O7. The higher sulfates are regenerated by reaction of this product with H2SO4. Solids handling and decomposition were studied in a laboratory-scale rotary kiln and a dual-particle fluidized bed. Kiln experiments with Bi2O(SO4)2, ZnSO4, and Co3O4 show that in temperature range of 1125 to 1285 K, over 90 percent decomposition occurs during the 60 s residence time. A higher temperature is required for La2(SO4)3 decomposition. A dual-particle fluidized bed was constructed and tested with ZnSO4 powder. T.M.

N82-16503# Sandia Labs., Albuquerque, N. Mex.
COMPATIBILITY AND ACCELERATED AGING STUDY FOR Li(Si)/FeS2 THERMALLY ACTIVATED BATTERIES
J. W. Mead, J. Q. Searcy, P. A. Neiswander, and R. L. Poole 1981 12 p refs Presented at the JOWOG-12 Conf., Alermaston, England, 21 Sep. 1981
(DE81-030210; SAND-81-1955C; CONF-810953-1) Avail: NTIS HC A02/MF A01

Thermally activated batteries using Li(Si)/FeS2 for use in systems which require a storage life of 25 years and high reliability are examined. All of the materials in the system, both organic and inorganic are incorporated except the heat paper and electric match are studied. No compatibility or aging problems are indicated. The following results are reported: oxygen vanishes from the overgas in containers that were accelerated aged; hydrogen increases sharply in the overgas initially but generally decreases as aging progresses. No unexpected or significant changes were observed in the volume resistivity, glass transition temperature, or shear modulus or organic materials. DOE

N82-16504# Oak Ridge National Lab., Tenn.
ENERGY IN THE 1980S: A CALL FOR LEADERSHIP. THE PUBLIC AWARENESS SYMPOSIUM
Jul. 1981 79 p refs Presented at WATTec Energy Awareness Conf., Knoxville, Tenn., 18-20 Feb. 1981

(Contract W-7405-eng-26)
(DE81-027613; CONF-810250) Avail: NTIS HC A05/MF A01

A variety of programs was offered. Issues relevant to US energy problems were addressed. The energy-related wares of 43 leading domestic and foreign industrial and commercial institutions were displayed. The public awareness symposium included business, government, religious, and educational leaders. The technical societies' presidents' program brought together 25 national presidents or their representatives to discuss mutual concerns. Finally, two $1000 engineering and communication scholarships were awarded for creating new and novel ways of providing the general public with information on complex energy-related technical matters. DOE

N82-16505# Sandia Labs., Albuquerque, N. Mex.
POTENTIAL FOR USING PARABOLIC TROUGH COLLECTORS TO SUPPLEMENT POWER CYCLE BOILERS
W. P. Schimmel, Jr. and L. L. Lukens 1981 17 p refs Presented at Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, D.C., 15 Nov. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-0572C; CONF-811101-3) Avail: NTIS HC A02/MF A01

The advantage of such a system is that solar energy is used to heat the water in a steam Rankine cycle device up to the superheat regime, thus displacing the fossil fuel usually required. The temperature associated with this portion of the power cycle is typically on the order of 320 C or less, which makes it compatible with current parabolic trough collector systems. A system model which lends itself to optimization studies was constructed and exercised over a range of the multiparameter space involved. The collector field, storage, supplementary fossil boiler and superheater, and turbine/generator traded off to obtain a series of economically optimal systems for various years and solar fractions. DOE

N82-16506# Oak Ridge National Lab., Tenn.
DEVELOPMENT OF A HIGH-EFFICIENCY GAS-FIRED WATER HEATER
A. D. Vasilakis, J. Gerstmann, J. F. Pearson, and D. J. Walukas (Union Carbide Corp., Oak Ridge, Tenn.) 1981 11 p refs Presented at Intern. Gas Res. Conf., Los Angeles, 28 Sep. 1981
(Contract W-7405-eng-26)
(DE81-032028; CONF-810909-6) Avail: NTIS HC A02/MF A01

Unlike conventional water heaters which use a center-flue water storage tank, the design decouples the water heating and storage functions through the use of an external heat exchanger, thus reducing standby losses. The compact high-effectiveness heat exchanger achieves a recovery efficiency of 82 percent, using a naturally-aspirated, 100 percent premixed burner. Besides its low cost, this burner has the additional advantage of producing very low emissions of NO sub x. The use of an internally insulated polyethylene lined 40 gallon storage tank is expected to provide significantly longer service life than conventionally-lined steel tanks, thereby enhancing consumer acceptance. A description of the design of the water heater and the results of prototype efficiency and emission tests are included. Also included are data on heat exchanger and storage tank temperature distributions, standby losses, and hot water delivery capability. T.M.

N82-16507# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
RISK OF PRODUCING ENERGY, AND CONSERVING IT
H. Inhaber, G. Caton, and R. Gove 1981 25 p refs Presented at 6th Intern. Symp. on the Uranium Inst., London, Sep. 1981
(Contract W-7405-eng-26)
(DE81-030807; CONF-810965-1) Avail: NTIS HC A02/MF A01

The idea that society can have a free lunch in the form of a risk-free energy system is rapidly fading away. All energy systems have some risk to human health, and for some it can be substantial. Nuclear power seems to have both a low occupational and public risk compared to other forms. In addition to this, research is presented with calculations on some of the risk associated with sealing up houses to keep heat in. When the effects of the accumulated radon are included; the risk per unit energy saved for this form of conservation can be great. Indeed, it appears to be much greater than the public risk of nuclear power. DOE

N82-16508# Oak Ridge National Lab., Tenn. Energy Div.
GAS-HEAT-PUMP DEVELOPMENT
Frederick A. Creswick 1981 6 p Presented at the Intern. Gas Res. Conf., Los Angeles, 28 Sep. - 1 Oct. 1981
(Contract W-7405-eng-26)
(DE81-031991; CONF-810909-7) Avail: NTIS HC A02/MF A01

Incentives for the development of gas heat pumps are discussed. Technical progress made on several promising technologies was reviewed. The status of development of gas-engine-driven heat pumps, the absorption cycle for the near- and long-term gas heat pump systems, the Stirling engine, the small Rankine-cycle engines, and gas-turbine-driven heat pump systems were briefly reviewed. Progress in the US, Japan, and Europe is noted. DOE

N82-16509# Rasor Associates, Inc., Sunnyvale, Calif.
THERMIONIC-COMBUSTOR COMBINED-CYCLE SYSTEM. VOLUME 3: A THERMIONIC CONVERTER DESIGN FOR GAS-TURBINE COMBINED-CYCLE SYSTEMS
G. O. Fitzpatrick, E. J. Britt, and R. S. Dick, Jr. May 1981 19 p refs
(Contract DE-AC02-76ET-11293)
(DE82-000729; DOE/ET-11293/T4-Vol-3; COO-2263-20-Vol-3; NSR-2-20-Vol-3) Avail: NTIS HC A02/MF A01

Thermionic converter design is strongly influenced by the configuration of the heat source and heat sink. These two externally imposed conditions are of major importance in arriving at a viable converter design. In addition to these two factors, the economical and reliable transfer of energy internally within the converter is another major item in the design. The engineering trade-offs effects made in arriving at the design chosen for the gas turbine combined cycle combustor are reviewed. DOE

N82-16510# Department of Energy, Washington, D. C. Assistant Secretary for International Affairs.
ENERGY INDUSTRIES ABROAD
Sep. 1981 299 p refs
(DE82-001896; DOE/IA-0012) Avail: NTIS HC A13/MF A01

The relationships between foreign governments and energy industries in many of the world's most important energy producing and consuming nations are examined. The history of hydrocarbon exploration and production is traced and the concessionary and other contractual arrangements entered into by foreign governments and international oil companies are reviewed. Petroleum legislation that was enacted, how government institutions gradually assumed more responsibility for energy matters, and how the former concessionaires adapted to accommodate this increased government participation in the energy sector is described. DOE

N82-16511# Lincoln Lab., Mass. Inst. of Tech., Lexington.
REDUCING CONVECTIVE LOSSES FROM COVER GLAZINGS OF SOLAR-THERMAL COLLECTORS
Pattabiraman Raghuraman and Daniel Kon 1981 8 p refs Presented at the Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, D.C., 15-20 Nov. 1981
(Contract DE-AC02-76ET-20279)
(DE81-025726; DOE/ET-20279/146; CONF-811101-9) Avail: NTIS HC A02/MF A01

Convective heat losses from cover glazings of solar thermal collectors are reduced by forming perpendicular crisscross rectangular grooves on the glazing which cause the air flow to form recirculating zones in the grooves. Experiments on the effects of varying groove geometry show that the cover-glazing convective heat transfer coefficient can be reduced by a factor of four or better. Results of the experimental and analytical work and a description of the design considerations in optimizing the groove geometry are presented. DOE

N82-16512# California Univ., Livermore. Lawrence Livermore Lab.
TEMPERATURE AND CONCENTRATION TRANSIENTS IN THE ALUMINUM-AIR BATTERY
Robert V. Homsy 26 Aug. 1981 22 p refs Presented at the Electrochem. Soc. Conf. Denver, Colo., 11 Oct. 1981
(Contract W-7405-eng-48)
(DE81-030338; UCRL-86648; CONF-811013-4) Avail: NTIS HC A02/MF A01

Coupled conservation equations of heat and mass transfer are solved that predict temperature and concentration of the electrolyte of an aluminum-air battery system upon start-up and shutdown. Results of laboratory studies investigating the crystallization kinetics and solubility of the caustic-aluminate electrolyte system are used in the predictions. Temperature and concentration start-up transients are short, while during standby conditions, temperature increases to maximum and decreases slowly. DOE

N82-16513# Arizona Univ., Tucson. Engineering Experiment Station.
CHOICE AND UTILIZATION OF ENERGY-USING DURABLES
Electric Power Research Inst. Aug. 1981 349 p refs Workshop held in Boston, 1-2 Nov. 1979 Sponsored by Electric Power Research Inst.
(EPRI Proj. 1050)
(DE81-904228; EPRI-EA-1961; CONF-7911154) Avail: NTIS HC A15/MF A01

The adequacy of state of the art methods to analyze the choice and utilization of energy using durables by households is assessed. The long run adjustment process of households to higher energy prices is characterized in large part by their choice of type and efficiency of new energy using durables (e.g., major appliances and automobiles). Trade-offs must be made between original purchase price and future operating costs, the latter depending not only on prospective energy costs but on expected levels of utilization. Considerable progress has been made in modeling these important factors and their interactions. DOE

N82-16514# Pacific Northwest Lab., Richland, Wash.
ANALYSIS TO DEVELOP A PROGRAM FOR ENERGY-INTEGRATED FARM SYSTEMS
D. E. Eakin, M. A. Clark, L. K. Inaba, and K. I. Johnson Sep. 1981 127 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000318; PNL-3981) Avail: NTIS HC A07/MF A01

A program to use renewable energy resources and possibly develop decentralization of energy systems for agriculture is discussed. The program's objective is determined by: (1) an analysis of the technologies that could be utilized to transform renewable farm resources to energy by the year 2000, (2) the quantity of renewable farm resources that are available, and (3) current energy-use patterns. Individual research, development, and demonstration projects are fit into a national program of energy-integrated farm systems on the basis of market need, conversion potential, technological opportunities, and acceptability. Quantification of these factors for the purpose of establishing program guidelines is conducted using the following four precepts: (1) market need is identified by current use of energy for agricultural production; (2) conversion potential is determined by the availability of renewable resources; and (3) technological opportunities are determined by the state-of-the-art methods, techniques, and processes that can convert renewable resources into farm energy. DOE

N82-16515# Department of Energy, Washington, D. C. Office of Assistant Secretary for Conservation and Renewable Energy.
DAYLIGHTING
Sep. 1981 12 p
(DE82-000930; DOE/CE-0022) Avail: NTIS HC A02/MF A01

A catalog focusing on daylighting design and calculation methods in commercial buildings is presented. Primary sources of daylight in buildings are described briefly. Problems of appropriate design to maximize the use of daylighting; lighting controls; and operable Sun control devices are discussed. DOE

N82-16516# Oak Ridge National Lab., Tenn. Engineering Technology Div.
ASSESSMENT OF SEASONAL-EFFICIENCY MODELS FOR NATURAL-GAS-FIRED RESIDENTIAL FURNACES
N. Domingo and E. G. Keshock Sep. 1981 81 p refs
(DE82-000499; ORNL-5801) Avail: NTIS HC A05/MF A01

Several methods for determining the seasonal efficiency and operating costs of residential fossil-fuel-fired heating systems are discussed. Four computer models for determining such efficiency, the Honeywell HFLAME model, the National Bureau of Standards DEPAF model, the Institute of Gas Technology SPACE-FI model, and the Carrier Corporation model, are separately described, discussed, and evaluated in relation to their use in predicting seasonal performance of residential gas-fired heating systems. A general conclusion is that purely analytical estimations of seasonal furnace efficiencies are not generally reliable principally because of: (1) a variety of furnace designs; and (2) the different infiltration characteristics of homes. DOE

N82-16517# Foster Wheeler Corp., Livingston, N.J.
INDUSTRIAL STEAM SUPPLY SYSTEM CHARACTERISTICS PROGRAM. PHASE 2: LOW- AND MEDIUM-Btu GAS-FIRED BOILERS WITH ASSOCIATED GASIFICATION PLANTS Final Report
Sep. 1981 292 p refs Prepared for ORNL
(Contract W-7405-eng-26)
(DE82-000535; ORNL/Sub-80/13847/2; FWDC-9-41-8903) Avail: NTIS HC A13/MF A01

For each system, two coal sources were considered, an Eastern high-sulfur bituminous coal and a Western low-sulfur subbituminous coal. Eight different systems were studied and conceptual cost estimates prepared for each of them. Scaling factors were developed over a range of plant sizes; cost ratios were prepared for multiple unit systems; and cost sensitivities vs degree of sulfur removal were developd for each of the on-site gasification systems. T.M.

N82-16518# Brookhaven National Lab., Upton, N. Y. Technology and Data Div.
MODELING SOLAR-ENERGY SYSTEMS FOR ECONOMIC OPTIMIZATION
Richard W. Leigh 1981 6 p refs Presented at the 4th World Eng. Congr., Atlanta, 12 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE81-030030; BNL-29963; CONF-811030-2) Avail: NTIS HC A02/MF A01

A simple analytic model of solar energy systems is presented which can describe how the performance of the system depends on collector area and storage capacity with surprising accuracy. The model can then be used to determine easily the optimal (lower cost) configuration of collector area and storage capacity, and to see how this configuration will change under various possible fuel, collector, or storage costs. DOE

N82-16519# Booz-Allen and Hamilton, Inc., Bethesda, Md. Energy Analysis and Environment Div.
ASSESSMENT OF EMERGING ENERGY SOURCES Summary Report
Sep. 1981 43 p refs
(DE82-900318; EPRI-EA-2023-SY) Avail: NTIS HC A03/MF A01

The results of a broad review and analysis of the commercialization potential for eight emerging sources of energy are summarized. Tight gas sands, heavy oil, methane from geopressured aquifers, oil shale, enhanced oil recovery, advanced coal mining technologies, and underground coal gasification are discussed. Each source of energy or technology was evaluated with respect to six factors affecting commercialization: size and characteristics of resource; technical and economic performance; relevant energy market growth rates; logistical considerations; development lead times; and regulatory and institutional factors. The evaluation was based on a review of existing literature, extensive interviews with industry expert, and an overall assessment of the degree to which these factors would constrain commercial development. In addition, estimates were made of supply potential from each emerging energy. DOE

N82-16520# Oak Ridge Associated Universities, Tenn. Labor and Policy Studies Program.

SOME EMPLOYMENT AND EARNINGS IMPLICATIONS OF REGIONAL BIOMASS ENERGY UTILIZATION: NEW ENGLAND AND THE CORNBELT STATES

Wayne Stevenson, Sharon E. Bell, Larry M. Blair, Ruth M. Gove, and Joanna R. Little Aug. 1981 244 p refs

(Contract DE-AC05-76OR-00033)

(DE81-030689; ORAU-181) Avail: NTIS HC A11/MF A01

Because of their abundant forest and agricultural biomass resources, New England and the Cornbelt are likely to grow considerably in the development of biomass energy systems during the next decade or two. Forty thousand or more permanent jobs might be created in New England's wood energy industry by the end of the century. If alcohol-fuel use continues to grow, even greater potential for employment in biomass energy exists in the Cornbelt states. The associated earnings would be quite substantial for both regions. The direct combustion of wood and activities related to alcohol-fuel production are expected to be the major contributors to biomass energy production, employment, and earnings; but other biomass systems show potential as well. Energy extraction from municipal waste, anaerobic digestion of animal manure, and other biomass conversion systems will all generate employment as they grow in use. DOE

N82-16521# Exxon Research and Engineering Co., Linden, N.J. Advanced Energy Systems Labs.

DESIGN AND COST ANALYSIS OF A 20-kWh BIPOLAR ZINC-BROMINE BATTERY

Harry Einstein, Richard V. Bellows, Patrick Grimes, Edward Kantner, Paul Malachesky, and Kenneth Newby 1981 4 p refs Presented at 6th Elec. Vehicle Council Symp., Baltimore, 21 Oct. 1981

(Contract DE-AC04-76DP-00789)

(DE81-030117; SAND-81-7147C; CONF-811010-4) Avail: NTIS HC A02/MF A01

Exxon's approach to the system uses conductive carbon plastic electrodes in a bipolar configuration, separable bromine complexes, and selective membranes in a circulating electrolyte design. The battery design consists of two kWh battery stacks placed back-to-back with a common center electrolyte feed block. Each of the two battery stacks consists of 78 cells for a system voltage of 120 volt output. Active electrode area per electrode is 12 sq dm cell-to-cell spacing is 0.25 cm. The two-stack module is assembled over a tray serving as a cover for the plastic electrolyte reservoir. Unit cells are comprised of alternating bipolar electrodes and separator assemblies. The projected battery factor price is discussed, along with the manufacturing, materials, and labor costs. T.M.

N82-16522# Power Technologies, Inc., Schenectady, N. Y.

DYNAMICS OF SINGLE- AND MULTI-UNIT WIND-ENERGY CONVERSION PLANTS SUPPLYING ELECTRIC UTILITY SYSTEMS

E. N. Hinrichsen and P. J. Nolan Aug. 1981 141 p refs

(Contract DE-AC01-78ET-20466)

(DE82-000666; DOE/ET-20466/78/1) Avail: NTIS HC A07/MF A01

The development of large wind turbine generators (WTGs) and their integration into electric power systems is accelerating. Since wind is neither as steady nor as dense a form of energy as steam or water, wind turbine generators differ greatly in construction and operation from steam and hydro turbine generators. The dynamic behavior of WTGs connected to utility power systems, was examined. DOE

N82-16523# Argonne National Lab., Ill. Energy and Environment Systems Div.

ANALYSIS OF STATE-ENERGY-PROGRAM CAPABILITIES

John Tatar, Donald Clifford, Forrest Gunnison (Science Applications, Inc.), and Barbara Humphrey May 1981 62 p refs

(Contract W-31-109-eng-38)

(DE82-001963; ANL/CNSV-TM-82) Avail: NTIS HC A04/MF A01

The potential effects on state energy programs of a reduction in the financial assistance available through the state and local assistance programs and the distribution of those effects are assessed. The assessment is based on a survey of nine state energy offices (SEOs), which were selected on the basis of state support of energy programs weighted by state energy consumption. The nine SEOs surveyed were the Arizona Energy Office, Arkansas Department of Energy, California Energy Commission, Florida Governor's Energy Office, Illinois Institute of Natural Resources, Minnesota Energy Agency, New Jersey Department of Energy, South Carolina Governor's Division of Energy Resources, and Washington State Energy Office. T.M.

N82-16524# Public Service Co. of Indiana, Plainfield.

COMPRESSED AIR ENERGY STORAGE PRELIMINARY DESIGN AND SITE DEVELOPMENT PROGRAM IN AN AQUIFER. TURBOMACHINERY DESIGN Final Report

P. A. Berman, J. S. Bonk, W. F. Kobett, N. S. Kosanovich, L. J. Long, and D. J. Marinacci 31 Jul. 1981 559 p Prepared in cooperation with Westinghouse Electric Corp., Concordville, Pa. Sponsored in part by EPRI

(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. RP 1081-3)

(DE82-000672; DOE/ET-29232/T4-Vol-5-Pt-1) Avail: NTIS HC A24/MF A01

Compressed Air Energy Storage (CAES) is a means of storing electrical energy generated by utility baseload power plants during off-peak hours. This stored energy will be used during periods of high demand. Compressed Air Energy Storage (CAES) system uses off-peak power from an electrical grid to operate an electric dynamo. This is used as a motor to drive a compressor train that charges atmospheric air at elevated pressure into an underground aquifer. During high electrical demand periods, the pressurized air is withdrawn from the aquifer and channeled to combustors where it is heated and then expanded through a combustion turbine. The turbine drives the electric dynamo, being operated as a generator, to supply power back to the grid. Since the CAES turbine train is divorced from the compressor during power generation, the net output power is about three times that of a normal combustion turbine. Although the fuel consumption rate is nearly the same, the heat rate is much lower. DOE

N82-16525# Mathematical Sciences Northwest, Inc., Bellevue, Wash.

ENERGY EXCHANGER PERFORMANCE AND POWER CYCLE EVALUATION, EXPERIMENTS AND ANALYSIS Final Report, 23 May 1978 - 31 Dec. 1980

W. J. Thayer, III, Robert T. Taussig, John F. Zumdieck, Thinium S. Vaidyanathan, and Walter H. Christiansen Apr. 1981 161 p refs

(Contract DE-AC06-78ER-01084)

(DE82-001069; DOE/ER-01084/T1) Avail: NTIS HC A08/MF A01

The energy exchanger, or pressure exchanger, is a rotating, axial flow machine which utilizes unsteady gasdynamic processes to directly transfer work between two gas streams. A program which has provided technology required for the development of efficient energy exchangers for power operation applications is described. The program contains three major elements: testing of a laboratory scale device, development of an energy exchanger flow model, and analysis of potential applications in advanced power generation cycles. The test energy exchanger was developed and tested over a range of operating conditions. This device transferred approximately 100 kW of mechanical power between two gas streams by simultaneously expanding one stream and compressing the other through pressure ratios of approximately 2.5. The efficiency of this transfer process was as high as 74%. DOE

N82-16526# Technical Univ. of Denmark, Copenhagen. Thermal Insulation Lab.

HEAT STORAGE WITH AN INCONGRUENTLY MELTING SALT HYDRATE AS STORAGE MEDIUM BASED ON THE EXTRA WATER PRINCIPLE

Simon Furbo Dec. 1980 17 p refs

(DE82-901186; DTH-LV-MEDD-108; Rept-8) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The extra water principle, a heat of fusion storage method, is described. The extra water principle uses an inorganic, incongruently melting salt hydrate as a reliable and stable storage medium in an inexpensive way. Different heat storages using the extra water principle are described. The advantages of using

a heat fusion storage unit based on Na2S2O(3).5H2O and the extra water principle instead of a traditional hot water tank in small solar heating systems for domestic hot water supply are shown. In small solar heating systems the heat fusion storage supplies all the wanted hot water in the summer during longer periods than an ordinary hot water storage. It is concluded that the heat of fusion storage is favorable in domestic hot water supply systems with an auxiliary energy source which during the summer have a large energy consumption compared with the energy demands for the hot water supply. DOE

N82-16527# Battelle Pacific Northwest Labs., Richland, Wash.
DEVELOPMENT OF A LOW-COST BLACK-LIQUID SOLAR COLLECTOR, PHASE 2 Final Report, Sep. 1979 - Jul. 1981
D. K. Landstrom, S. G. Talbert, and V. D. McGinniss 30 Sep. 1981 225 p refs
(Contract DE-AC04-79CS-30171)
(DE82-000033; DOE/CS-30171/3) Avail: NTIS HC A10/MF A01

Research efforts were directed toward: evaluating the long-term durability of various plastic materials and solar collector designs; obtaining sufficient outdoor performance data to design a full-scale demonstration of a black liquid solar collector for a commercial application; working closely with a company willing to investigate the possible commercialization of a black liquid plastic collector; and incorporating improved black liquides with the identified plastic collector designs. Indoor weathering tests of various plastics have continued and two outdoor automated test facilities were constructed. One unit was installed at Columbus, Ohio, and the other unit was installed in Phoenix, Arizona. In addition, test facilities in Florida were utilized for static outdoor testing of candidate materials. Results indicate that the black liquid collector is a viable concept and the collectors manufactured during the course of this study were able to perform as theoretically predicted. There are some long-term durabilty problems still associated with the black liquid collector systems. However, current indications are that a suitable system can be built that should have an expected lifetime of up to 15 years with only marginal (less than 10%) performance degradation. DOE

N82-16528# Argonne National Lab., Ill.
DESIGN, CONSTRUCTION, AND INITIAL OPERATION OF THE ANL RESEARCH
Y. S. Cha, W. T. Sha, and J. R. Hull Aug. 1981 50 p refs
(Contract W-31-109-eng-38)
(DE82-001961; ANL-81-55) Avail: NTIS HC A03/MF A01

The design consideration of a 1/4 acre research salt-gradient solar pond is described. Experience learned during the construction of the solar pond is presented. Initial operation of the pond indicates that the construction of the pond is sound and no leakage has occurred. The pond began to warm up during March of 1981. The maximum pond temperature reached 630 C at the end of July and it is still rising. All signs indicate that the operation of the well instrumented pond will be a success and the performance of the pond will be as expected, if not better. DOE

N82-16529# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF HYDROCONVERSION OF BIOMASS TO SYNETHETIC FUELS. PROJECT 61042 TECHNICAL REPORT Technical Progress Report, 16 May - 30 Sep. 1980
Dec. 1980 57 p refs
(Contract DE-AC02-80CS-83004)
(DE82-000874; DOE/CS-83004/1) Avail: NTIS HC A04/MF A01

The objective of this program is to develop the hydroconversion (in-situ production and addition of hydrogen to carbonaceous species) of biomass (forest and crop residues) to produce substitute natural gas. The program will also include experiments to investigate the production of hydrocarbon liquids from biomass. Progress made during the first reporting period is reported. A list of recent biomass survey and availability literature was compiled; samples of wood materials were obtained for characterization, handling, and bench-scale testing. Standard chemical and physical tests for biomass materials were identified for use in characterizing each material and its char in the program. The initial analysis and testing began with a sample of Douglas fir hog fuel. Bench-scale hydrodevolatilization and char gasification tests were performed. Experiments with maple hardwood chips are in progress. A detailed report describing the process development unit design was submitted. DOE

N82-16530# Oak Ridge National Lab., Tenn.
MATERIALS TESTING FOR SOLAR-THERMAL CHEMICAL PROCESS HEAT
T. N. Tiegs Oct. 1981 63 p refs
(Contract W-7405-eng-26)
(DE82-002003; ORNL/TM-7833) Avail: NTIS HC A04/MF A01

Considerable interest has arisen recently in the production of hydrogen from water using solar thermal energy. The most advanced chemical cycles being developed in the United States and abroad all have the decomposition of sulfuric acid at elevated temperatures as the final step in the cycle. Materials required in the production of hydrogen were tested. The materials tested included (-)-SiC, siliconized SiC, MgO, ZrO2(Y2O3 stabilized), ZrO2(MgO stabilized), and silicon aluminum oxynitride (or sialon). Ring specimens of these materials were exposed for varying periods of time in a simulated H2SO4 decomposition environment at 1000 and 12250 C. The specimens were examined visually, metallographically, by X-ray diffraction, and with a scanning electron microscopes. In addition, the specimens were tested for changes in their fracture stress and weight. The silicon carbide materials, both alpha and siliconized, were the best performers. The other materials tested showed V)-iron(II) oxides of 10 kcal/mol, and the amount of analytical solution. DOE

N82-16531# Winter (Steven) Associates, Inc., New York, N.Y.
CODE WORKBOOK FOR ACTIVE AND PASSIVE SOLAR DESIGN: SINGLE-FAMILY RESIDENTIAL CONSTRUCTION
Sep. 1981 109 p refs
(DE82-000637; MASEC-SCR-81-085) Avail: NTIS HC A06/MF A01

Important codes and standards enforced or referenced in the Mid-American Solar Energy Complex region are described. Analyses of the basic codes written by major code agencies and those Federal agency guidelines which have a significant impact on building activity in the MASEC region are included. State and local codes and code agencies are identified. DOE

N82-16532# Mid-American Solar Energy Complex, Minneapolis, Minn.
CASE STUDIES OF RETROFIT APPLICATIONS OF SOLAR ENERGY IN THE MASEC REGION
Sep. 1981 11 p refs
(Contract DE-AC02-79CS-30150)
(DE82-001712; MASEC-R-81-081; A-101-6) Avail: NTIS HC A02/MF A01

Six case studies are presented of residential solar retrofits. Each case study includes a photograph illustrating the type of retrofit, system description, siting orientation, system cost, energy savings, operational problems, and the homeowner's assessment of system performance and satisfaction. The retrofits presented cover a wide geographic area, and include active solar domestic hot water, greenhouses, and passive solar direct gain. DOE

N82-16533# Mid-American Solar Energy Complex, Minneapolis, Minn.
THE CLASS C PASSIVE PERFORMANCE EVALUATION PROGRAM Final Report
Sep. 1981 24 p
(Contract DE-AC02-79CS-30150)
(DE82-000454; MASEC-R-81-014; P-101-2) Avail: NTIS HC A02/MF A01

The Class-C performance which provides information on qualities of passive solar features which make them attractive to buyers was evaluated. The following topics are discussed: design of an audit form; design of regionally specific audit addenda; determination of site selection criteria; identification of sites; selection, training, and management of auditors; and packaging of materials of subcontractors for evaluation. Results and findings are presented as follows: demographic profile, passive solar home

profile, cost, financing, and payback considerations, expectations, realizations, and satisfaction, and decisionmaking. DOE

N82-16534# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
BOISE CASCADE: INEL SOLAR HOME Data Report, 1 Jul. 1980 - 31 Mar. 1981
Ken H. Liebelt, Adrienne H. Novick, and James I. Mills Jul. 1981 107 p refs
(Contract DE-AC07-76ID-01570)
(DE82-003778; EGG-CS-5504) Avail: NTIS HC A06/MF A01

The operating data on the Bosie Cascade-INEL solar homes located in Boise and Idaho Falls, Idaho, are summarized for the period from July 1, 1980 through March 31, 1981. All three major system functions are discussed: space heating, domestic hot water heating, and space cooling. In addition, the update data acquisition system, which allows for simultaneous acquisition and analysis of data, and also the new data reduction and analysis capabilities are discussed. The general performance of the houses during the reporting period is summarized, but it is beyond the scope of this report to present a detailed analysis of the data or to completely address existing data anomalies. DOE

N82-16535# Argonne National Lab., Ill. Energy and Environmental Systems Div.
EFFECTS OF AMMONIA CONTAMINATION BY WATER ON OTEC POWER SYSTEM PERFORMANCE
C. B. Panchal, J. J. Lorenz, and D. L. Hillis Aug. 1981 51 p refs
(Contract W-31-109-eng-38)
(DE82-001832; ANL/OTEC-PS-8) Avail: NTIS HC A04/MF A01

Tests were conducted with evaporators produced by Trane, Johns Hopkins University's Applied Physics Laboratory (APL), and Linde to determine the loss in heat-transfer performance resulting from contamination of ammonia by water. A stepwise integration procedure was developed to determine the overall heat-transfer coefficients from experimental data. Results indicated that the heat-transfer coefficient of the evaporator decreases with increasing water content of the ammonia. At water concentrations below 0.1%, the reduction in the overall heat-transfer coefficient was less than 1% for all three evaporators. For more than 0.1% water, the loss in performance becomes increasingly significant. At 1% water, the reduction in the heat-transfer coefficient was found to be 4%, 8%, and 10%, for the Trane, APL, and Linde evaporators, respectively. DOE

N82-16536# Oak Ridge Y-12 Plant, Tenn. Nuclear Div.
ROTOR TESTING IN FY 1981
R. S. Steele, Jr. and E. F. Babelay, Jr. 13 Jul. 1981 8 p refs Presented at the Mech., Magnetic and Underground Energy Storage Ann. Contractors' Rev., Washington, D.C., 24-26 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028340; Y/DX-338; CONF-810833-4) Avail: NTIS HC A02/MF A01

Flywheel spin tests conducted for the mechanical energy storage technology project are summarized. Two types of tests are discussed: (1) an ultimate speed test, which includes ultimate speed evaluations for a tapered, quasi isotropic, graphite composite flywheel, a constant thickness disk with an SMC core and circumferentially wound graphite restraining ring, and a constant thickness disk with an S-glass alpha-ply layup core and circumferentially wound graphite ring; (2) a cyclic fatigue test. A matching flywheel was used as the first test unit. Test results and general observations and conclusions are presented. DOE

N82-16537# Alabama Energy Management Board, Montgomery.
OPELIKA RESOURCE RECOVERY PROJECT: REPORT ON THE TECHNOLOGICAL AND ECONOMIC EVALUATION
Jul. 1981 127 p refs
(Contract DE-FG01-79CS-20243)
(DE81-030098; DOE/CS-20243/1) Avail: NTIS HC A07/MF A01

A resource recovery facility for the city of Opelika, Alabama was investigated and surrounding areas were examined for waste stream characteristics. Technological options for waste disposal were examined. The technological options were ranked according to specific criteria of market characteristics, compatibility, and commercial viability. A particular resource recovery system applicable to Opelika was identified and an economic analysis performed to compare its relative costs to that of landfilling. DOE

N82-16538# Northeast Solar Energy Center, Boston, Mass. Dept. of Consumer Affairs.
SOLAR CONSUMER ASSURANCE: AN ASSESSMENT OF MECHANISMS IN THE NORTHEAST
Roberta Ward Walsh May 1981 88 p
(Contract DE-AC02-80CS-30149)
(DE81-030052; NESEC-9) Avail: NTIS HC A05/MF A01

Results and analysis of assessments in the nine states served by the Northeast Solar Energy Center are reported. Mechanisms were categorized according to the following objectives the informal consumer, the competent installer, assuring product quality and performance, and responsiveness to consumer grievances. DOE

N82-16539# RMR Associates, Palo Alto, Calif.
COGENERATION POTENTIAL: ENHANCED OIL RECOVERY Final Report
R. M. Rodden and J. L. Boyen Aug. 1981 69 p refs Sponsored by EPRI
(EPRI Proj. 1276-7)
(DE81-904202; EPRI-EM-1996) Avail: NTIS HC A04/MF A01

The purpose of this project was to perform preliminary evaluation of the potential in the United States for generating electric power in connection with producing steam for the enhanced recovery of oil. The analysis identified the size and location of the heavy oil resource base and developed estimates of oil recovery potential. Using these data, estimates were made of electric power capacity that could result if cogeneration were used to supply the necessary steam for thermal recovery. Incentives and obstacles to the use of cogeneration for thermally enhanced oil recovery are identified and discussed. The attitudes of the utilities companies and the petroleum producers toward the possible use of cogeneration for thermal oil recovery are also identified and discussed. The report presents preliminary design information on cogeneration systems that would be suitable for thermally enhanced recovery. DOE

N82-16540# Mid-American Solar Energy Complex, Minneapolis, Minn.
PASSIVE SOLAR PRODUCTS CATALOG, 1981
M. M. Dotseth 1981 362 p
(Contract DE-AC02-79CS-30150)
(DE82-000292; MASEC-H-81-041) Avail: NTIS HC A16/MF A01

The Passive Solar Products Catalog was compiled through contacts with over 500 manufacturers and distributors across the country. The product listings are from manufacturers who responded to requests for information and the descriptions are based on information contained in the product literature. Only those products which can be marketed at this time are listed in the 1981 catalog. The catalog contains over 300 product listings. The catalog is organized according to product function and application including passive solar components and design resonances and miscellaneous products. Manufacturer and product indexes are included as a cross reference in the back of the catalog. Distributors are not listed since most manufacturers prefer to have product inquiries initially directed to them. DOE

N82-16541# Argonne National Lab., Ill. Energy and Environmental Systems Div.
OTEC PERFORMANCE TESTS OF THE TRANE PLATE-FIN HEAT EXCHANGER
C. B. Panchal, D. L. Hillis, J. J. Lorenz, and D. T. Yung Apr. 1981 48 p refs
(Contract W-31-109-eng-38)
(DE82-001833; ANL/OTEC-PS-7) Avail: NTIS HC A03/MF A01

The Trane heat exchanger was tested as an evaporator, and separately as a condenser, at the following nominal operating conditions: water flow rate, heat duty, and ammonia feed rate (applicable to evaporator test only). Operated as an evaporator

in the forced convection mode, the overall heat transfer coefficient (U0) of the unit was 1235 Btu/h.ft(2).0F. Tests were conducted at heat duties ranging from 2.4 million to 4 million Btu/h, and at ammonia feed rates ranging from 18 to 40 gpm. Operated as an evaporator in the falling film mode, at the same nominal conditions as listed above, U0 and 1035 Btu/h.ft(2).0F. At a constant heat duty, increasing ammonia feed rate from 22 to 50 gpm increased U0 by about 30%. Operated as a condenser, the unit's U0 was 870 Btu/h.ft(2).0F. DOE

N82-16542# Houston Univ., Tex. Energy Lab.
SOLAR ENERGY SYSTEMS SIMULATION AND ANALYSIS Quarterly Progress Report, 1 Nov. - 30 Dec. 1980
Loren L. Vant-Hull 10 Jan. 1981 36 p refs
(Contract DE-AC03-76SF-10763)
(DE81-026975; DOE/SF-10763/T10; QPR-5) Avail: NTIS HC A03/MF A01

A subroutine to provide central receiver performance simulation code STEAEC with the capability of interpolating the UofH NS code performance summary has been written and is documented herein. A call of this subroutine obviates the need to extrapolate day/hour output efficiencies to produce the elevation-azimuth field performance data, which often involves non-physical Sun locations. The changes are completely transparent to the user. The aspect ratio study was delayed while substantive improvements to the handling of heliostate spacing subject to mechanical limits were made. Mechanical limits play a definitive roll as the aspect ratio increases. The improvements are described. Work on insolation modeling is being culminated with the development of a new procedure for accounting for atmospheric transmission losses between heliostat and receiver. A detailed interpolation/extrapolation procedure based on the LOWTRAN 3 analysis was developed. Subroutines to provide all the necessary input data were also generated. Work has begun on a tentative basis which will lead to a user compatible version of the IH code and to an accompanying users guide. DOE

N82-16543# RCA Labs., Princeton, N. J.
PHOTOVOLTAIC MECHANISMS IN POLYCRYSTALLINE THIN-FILM SILICON SOLAR CELLS Final Report, 31 May 1979 - 30 May 1981
D. Redfield Jun. 1981 79 p refs
(Contract DE-AC01-79ET-23108)
(DE82-000868; DOE/ET-23108/8) Avail: NTIS HC A05/MF A01

The emphasis during this two-year program began with analysis of fundamental limitations to silicon solar-cell efficiency caused by heavy-doping effects. Near the middle, the emphasis shifted to explanation of the varied electronic properties of grain boundaries in Si. In the first area, and it was shown that all previous analyses which had neglected Auger recombination were necessarily invalid. Important consequences were also found for the strong gradients in dopant concentration that always occur in heavily doped diffused p-n junctions. When these new effects are combined, a simple, natural model results to explain limitations in Si solar-cell performance due to either front or base region effects on either J/sub sc/ or V/sub oc/. As part of this work, a new method was developed for accurate evaluation of the overall performance of AR coatings. DOE

N82-16544# National Mechanical Engineering Research Inst., Pretoria (South Africa).
DEVELOPMENTS IN SOLAR-POWERED AIR CONDITIONING: STATE-OF-THE-ART AND PROSPECTS FOR SOUTH AFRICA
A. Johannsen 1980 19 p refs Presented at Frigair Symp., Pretoria, 17-18 Jun. 1980; sponsored by the South African Inst. of Refrigeration and Air Conditioning
(PB81-246076; CSIR-ME-436; Paper-10) Avail: NTIS HC A02/MF A01 CSCL 13A

The state of the art of solar powered air conditioning is reviewed and its potential for South African conditions examined. Three basic cycles, namely the absorption cycle, the Rankine cycle, and desiccant cycle are discussed and their advantages and disadvantages compared. The open cycle type desiccant systems which appear to be well suited for South African conditions are discussed in greater detail. Included is a review of the various system configurations with solid and liquid desiccant and a comparison of their performance under different climatic conditions. Author

N82-16545# Economic Research Service, Washington, D. C. Natural Resource Economics Div.
COAL DEVELOPMENT IN RURAL AMERICA: THE RESOURCES AT RISK
Wallace McMartin, Virgil Whetzel, and Paul R. Myers Aug. 1981 92 p refs
(PB81-243313; RDRR-29) Avail: NTIS HC A05/MF A01 CSCL 10A

The resource base in rural America that will be affected by future mining, transportation, and use of coal is described. These resources are land, water, vegetation, people, and farm or ranch enterprises. Author

N82-16546# Groupe Centrale des Villes Nouvelles, Paris (France).
A COMPARISON OF ENERGY TECHNOLOGIES AND THEIR USE IN URBAN PLANNING
Claud Martinand and Eric Pebeyrotte Oct. 1980 21 p Presented at the 4th Ann. Conf. of the Intern. New Towns Assoc., Cairo, 6-14 Oct. 1980
(PB81-239592) Avail: NTIS HC A02/MF A01 CSCL 10A

A view of the new energy sources used in construction of new towns in France is given. The energies discussed include solar, geothermal, wind, refuse incineration, and cogeneration; the energy technologies outlined include heat pumps and load shedding. GRA

N82-16547# FDO Technische Adviseurs B.V. (Netherlands).
EXCHANGE OF NATIONAL EXPERIENCE IN THE FIELD OF NEW ENERGY SOURCES: IN PARTICULAR, SOLAR, WIND, AND GEOTHERMAL ENERGY: THE 25 m EXPERIMENTAL HORIZONTAL AXIS WIND TURBINE (25 m HAT)
G. B. Geerdink Oct. 1980 19 p Presented at the Sem. on Technol. Related to New Energy Sources, Juelich, West Germany, 8-12 Dec. 1980; sponsored by the Senior Advisers to ECE Governments on Science and Technology Sponsored by the Government of the Netherlands Prepared for the United Nations Economic Commission for Europe
(PB81-239568; UN-ECE-SC-TECH-SEM-7-R-6) Avail: NTIS HC A02/MF A01 CSCL 10B

The design of the wind generator, its rotor's capabilities, electricity generated, safety, various loadings, and instrumentation are discussed. Overall dimensions and weight of comments, the characteristics of the electrical system, of the yard mechanism and others are given in detail, including photos, drawings and graphs. GRA

N82-16548# National Bureau of Standards, Washington, D.C. Center for Building Technology.
ENERGY CONSERVATION BY MULTIPLE GLAZING ON HEAVY MASONRY BUILDINGS
E. Thomas Pierce Aug. 1981 29 p refs Sponsored in part by Architect of the Capitol
(PB81-246977; NBSIR-81-2317) Avail: NTIS HC A01/MF A01 CSCL 13A

The BLAST-2 computer program was used to investigate multiple glazing as a means to reduce the energy consumption of two buildings of the Library Congress in Washington, DC. The Thomas Jefferson building is of very heavy masonry construction, and the John Adams building is of heavy masonry. The techniques of modeling the building load and air system performance are explained. The results are presented and discussed. GRA

N82-16549# Little (Arthur D.), Inc., Cambridge, Mass.
NEW YORK STATE PLAN TO ENCOURAGE COMMERCIALIZATION OF MORE EFFICIENT GAS TECHNOLOGIES
Aug. 1981 189 p refs Sponsored by New York State Energy Research and Development Authority and New York Gas Group
(PB81-249997; NYSERDA-81-15) Avail: NTIS HC A09/MF A01 CSCL 10A

The results of a study to determine what field testing demonstration projects would be required to encourage commercialization of more efficient gas technologies and appliances

in New York State are given as well as the elements of a plan to carry out the tests and demonstrations. The present status of over 50 energy-saving gas technologies applicable to space conditioning, water heating, and cooking is examined. Three of the most promising technologies for commercialization were found to be: condensing furnaces and boilers; waste heat recovery; and fuel cells. GRA

N82-16550# General Accounting Office, Washington, D. C.
RESIDENTIAL ENERGY CONSERVATION OUTREACH ACTIVITIES: A NEW FEDERAL APPROACH
11 Feb. 1981 40 p refs
(PB81-242349; EMD-81-8) Avail: NTIS HC A03/MF A01 CSCL 10A

An evaluation of the Department of Energy's residential energy conservation outreach activities is presented. The contribution that outreach can make in achieving energy conservation is examined. The effectiveness of alternative techniques and DOE's current program and management are also examined. GRA

N82-16138*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SOLAR POWERED WATER PURIFICATION SYSTEM AT GOLDSTONE (DSS 13)
F. J. Menninger and R. J. Elder *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 352-354 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 10A

N82-16139*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ENERGY CONSUMPTION FOR THE ECHO STATION (DSS 12)
C. N. Guiar and D. Schonfeld *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 355-363 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 10B

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-16551# Council for Scientific and Industrial Research, Pretoria (South Africa). Air Pollution Research Group.
AIR POLLUTION AND RELATED PHENOMENA IN SOUTH AFRICA Annual Report, 1 Jul. 1979 - 30 Jun. 1980
30 Jun. 1980 63 p refs
(SR-APRG-12; IBSN-04-4988-2027-6) Avail: NTIS HC A04/MF A01

Progress in the monitoring of various pollutants, development of analytical methods for monitoring pollution effectively, and the study of the underlying physical and chemical processes governing the behavior of pollutants in the atmosphere is reported. Modeling of the wind field, momentum and energy transfer by eddy diffusion, and evaluation of diffusion models are among the topics addressed. J.M.S.

N82-16552# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
METHOD AND TECHNOLOGIES FOR REDUCING THE GENERATION OF METAL-BEARING SLUDGES AT AFLC INDUSTRIAL WASTE TREATMENT PLANTS Final Report, Jun. 1979 - May 1981
Anthony M. Wachinski Aug. 1981 126 p refs
(AF Proj. 2103)
(AD-A107552; AFESC/ESL-TR-81-29) Avail: NTIS HC A07/MF A01 CSCL 13/8

At present, the Air Force provides maintenance for its inventory of aircraft and associated systems at five industrial-complexes called Air Logistic Centers (ALCs). Wastewaters generated at the ALCs are treated by industrial waste treatment plants located on-site. The effluent is then discharged to a nearby stream or to a Privately Owned Treatment Works (POTW). During the period, 16 July 1979 to 3 May 1980, these facilities were surveyed for ways to reduce the volume of metal-bearing sludges generated by the IWTPs. Results of the surveys showed that the volume of sludge could be significantly reduced by a coordinated program of wastewater reduction, plating chemicals conservation, optimization of IWTP operation and sludge dewatering. Analyses of the sludges showed them to be nonhazardous by the EPA Toxicant Extraction Method. Data suggested that efforts to delist the sludges as nonhazardous were warranted. Also included are in-depth discussions of evaporation, ion exchange, and reverse osmosis and their application as recovery processes in Air Force electroplating operations. Author (GRA)

N82-16553# Brookhaven National Lab., Upton, N. Y.
MODIFICATIONS OF TRAJECTORY MODELS NEEDED FOR POLLUTANT SOURCE-RECEPTOR ANALYSIS
Paul Michael and Gilbert S. Raynor 1981 10 p refs Presented at the NATO/CCMS 12th Intern. Tech. Meeting on Air Pollution Modeling and its Appl., Palo Alto, Calif., 25-28 Aug. 1981 Submitted for publication
(Contracts DE-AC02-76CH-00016; EPA-79-DX-0533)
(DE81-029915; BNL-29924; CONF-810841-3) Avail: NTIS HC A02/MF A01

The difficulties one should expect to encounter when using the usual trajectory models to calculate source-receptor relationships for the incorporation of pollutants into precipitation are described. Sources of difficulty, the results of trajectory calculations that were performed to test the sensitivity of source-receptor relationships to transport layer assumptions, and some suggestions for future developments are presented. DOE

N82-16554# Oak Ridge National Lab., Tenn. Chemical Technology Div.
USE OF A PHENOLIC-CARBOXYLIC ACID CATION RESIN IN THE TREATMENT OF LOW-LEVEL LIQUID WASTE AT OAK RIDGE NATIONAL LABORATORY
J. M. Chilton Sep. 1981 18 p refs
(Contract W-7405-eng-26)
(DE82-000500; ORNL/TM-7524) Avail: NTIS HC A02/MF A01

The loading capacity of CS-100 resin, using plant waste as feed, was found to be significantly reduced after 20 loading-elution cycles; or less of the original capacity was retained after 30 cycles. Since the distribution coefficients for calcium and strontium are about six times greater than that for cesium, no loss of Sr 90 would be expected while Cs 137 is loading. Laboratory results obtained by using plant conditions and feed indicate that a typical bed would remove 96 percent of Sr 90 in the feed. Cobalt-60 is generally the greatest contributor to the radioactivity of the plant effluent. Laboratory tests indicate that this Co-60 is present as a mixture of a soluble anionic complex and insoluble colloids. The anionic complex could be removed by placing an anion exchange column in the effluent from the CS-100 resin bed. In studies of the dynamics of loading on CS-100 resin, the contact time in plant operation (3 to 4 min per column volume) was found to be more than adequate to obtain the desired results. DOE

N82-16555# Oak Ridge National Lab., Tenn. Environmental Scienes Div.
ACID RAIN AND FOREST PRODUCTIVITY
D. W. Johnson 1981 37 p refs Presented at IUFRO Meeting, Kyoto, Sep. 1981
(Contract W-7405-eng-26; EPRI Proj. 1813-1)
(DE81-030916; Publ-1717; CONF-810967-1) Avail: NTIS HC A03/MF A01

It is noted that acid rain can cause increases or decreases in forest productivity depending on site nutrient status and the duration and rate of inputs. Some acid irrigation studies have shown short-term growth increases due to increased N availability, yet long-term growth reductions remain theortically possible because of cation depletion and toxic aluminum accumulations in soils. It cannot be overremphasized that the problem of assessing acid rain effects on forest productivity is one of quantification. Generalization about acid rain effects without reference to the amount of acidic input and site nutrient conditions are hazardous. DOE

N82-16556# Oak Ridge National Lab., Tenn. Environmental Sciences Div.

ATMOSPHERIC DEPOSITION OF HEAVY METALS AND THEIR INTERACTION WITH ACID PRECIPITATION IN A NORTH AMERICAN DECIDUOUS FOREST

S. E. Lindberg, R. R. Turner, D. S. Shriner, and D. D. Huff 1981 4 p refs Presented at the Intern. Conf. on Heavy Metals in the Environment, Amsterdam, Sep. 1981

(Contract W-7405-eng-26)

(DE81-032004; CONF-810963-1) Avail: NTIS HC A02/MF A01

Atmospheric deposition dominates the landscape cycle of Pb and has a measurable influence on the cycles of Cd and Zn but a minimal influence on the Mn cycle in a deciduous forest in the eastern United States. Rain event deposition rates are orders of magnitude greater than the intervening dry deposition rates; however, dry deposition supplies 20 to 90 percent of the total annual input to the forest. Interactions between dry deposition and acid precipitation result in concentrations of metals and H(+) in the canopy 100 to 1000 times higher than rain concentrations alone. DOE

N82-16557# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

THERMODYNAMIC DATA FOR FLUE-GAS DESULFURIZATION PROCESSES

Leo Brewer Aug. 1981 56 p refs Presented at the FGD Symp., Morgantown, W. Va., 6-7 Nov. 1980

(Contract W-7405-eng-48)

(DE81-030545; LBL-11758; CONF-801176-1) Avail: NTIS HC A04/MF A01

Thermodynamic and kinetic data for the various materials that might be used in desulfurization processes resulting from coal and oil combustion are presented. Examination of the available thermodynamic data for sulfur compounds indicates serious uncertainties and a complete review is planned to provide the best set of internally consistent values obtainable from the literature and from current experiments. Although the main emphasis will be on information needed for aqueous limestone or lime slurry treatment, the data could also be used for other processes covering a wider temperature range. Thus it is planned to provide the data, when possible, for the range from room temperature to at least 1000K. The present compilation covers most of the materials that might play a role in SO2 extraction processes and for which data were found. Supplements will be issued as data are obtained for additional substances of interest. DOE

N82-16558# Paducah Gaseous Diffusion Plant, Ky.

DENITRIFICATION OF NITRATE-CONTAINING HEAVY-METAL-FILTRATE SOLUTIONS

W. N. Whinnery 1 Jul. 1981 61 p refs

(Contract W-7405-eng-26)

(DE82-000701; KY-712) Avail: NTIS HC A04/MF A01

The results indicate that biodenitrification of the PGDP heavy metal wastes reduced the nitrate concentration from 129,000 ppM to 10 ppM. Although batch treatment of the heavy metal filtrate proved successful at a low denitrification rate, continuous operation was not accomplished due to the accumulation of heavy metals in the sludge and the high metal content of the feed solution. Effects of the heavy metal solution filtrate as the biodenitrification feed solution are presented in relation to reactor operation and performance. An economic evaluation of a typical plant scale biodenitrification system, using present generation rates, would result in a disposal cost of greater than $250/barrel. T.M.

N82-16559# Argonne National Lab., Ill. Integrated Assessments and Policy Evaluation Group.

FLUE-GAS DESULFURIZATION: REVIEW OF SELECTED COMMERCIAL AND ADVANCED TECHNOLOGIES

Jerry L. Gillette and Shen-Yann Chiu Feb. 1981 187 p refs

(Contract W-31-109-eng-38)

(DE82-001960; ANL/FE-81-51) Avail: NTIS HC A09/MF A01

Selected technologies for the desulfurization of flue gas are reviewed and evaluated. One of the technologies, wet scrubbing of the gas with a slurry containing either lime or limestone, has attained widespread commercial usage and for this reason is presented as the base case against which 10 second-generation systems of flue-gas desulfurization (FGD) are compared. The new technology include chemical-treatment, or scrubbing, processes and processes that combine scrubbing and filtering of the flue gas. The two combination processes use baghouse filters, with the SO2-collecting material either injected dry or sprayed into the system. The eight straight-scrubbing processes use either wet or dry collecting materials and are identified as follows: aqueous-carbonate, copper-oxide, Bergbau-Forschung, sodium-sulfite-based double-alkali, DOA double-alkali, Chiyoda-121, magnesia, and Wellman-Lord. DOE

N82-16560# Exxon Research and Engineering Co., Linden, N.J. Contract Research Div.

FORMATION OF NO SUB x AND OTHER PRODUCTS FROM CHEMICALLY BOUND NITROGEN IN COAL COMBUSTION Final Report

David W. Blair and J. O. L. Wendt Jun. 1981 298 p refs

(Contract DE-AC21-77ET-11314)

(DE81-028536; DOE/ET-11314/T1) Avail: NTIS HC A13/MF A01

The purpose of this project was to advance the fundamental understanding of fuel nitrogen conversion in coal combustion towards the ultimate end of providing for the rational design of coal combustors with acceptably low NO/sub x/ outputs. In pursuit of this objective the program attacked the problem both experimentally and theoretically. Experimental work concentrated upon the pyrolysis stage of coal combustion. It investigated the loss of mass, nitrogen, and sulfur from the solid phase and the distribution of important chemical species in the pyrolyzate under simulated combustion heating conditions. Experimentally variables included temperature, heating rate, atmospheric reactivity, thermal history (preheating, reheating) and coal type. These experiments were performed upon twenty coals of widely varying types, two chars, and one petroleum coke. The results of the work suggest that the conditions of coal nitrogen conversion can be controlled by adjusting external variables. DOE

N82-16561# International Coal Refining Co., Allentown, Pa.

HAZARDOUS WASTE PRELIMINARY PLANNING REQUIREMENTS FOR SRC-1 DEMONSTRATION PLANT IN NEWMAN, KENTUCKY

29 May 1981 362 p refs Prepared for Kentucky Dept. of Natural Resources and Environmental Protection

(Contract DE-AC05-78OR-03054)

(DE82-001346; DOE/OR-03054/T8) Avail: NTIS HC A16/MF A01

The questions of soil types and permeability, suitability of the site for the proposed use, surface and subsurface geology, and hazards (seismic activities, flood, subsidence) are addressed. Information on the location and preliminary design concepts of hazardous waste disposal facilities are provided. The results of a geotechnical engineering study are reported along with an engineering interpretation of these with respect to the available project characteristics and recommendations to aid in the design and construction of foundations and other Earth related phases of the project. Additional liquefaction analyses were performed which considered both acceleration levels of 5 and 10% gravity and several flood conditions. T.M.

N82-16562# Department of Energy, Morgantown, W. Va.

ADVANCED ENVIRONMENTAL CONTROL TECHNOLOGY PROGRAM

Aug. 1981 32 p refs

(DE82-000898; DOE/METC/SP-187) Avail: NTIS HC A03/MF A01

The Department of Energy has established the Advanced Environmental Control Technology Program to protect the environment while supporting the development of more efficient and acceptable technologies utilizing domestic fossil fuels. This program consolidates cleanup efforts in ongoing technology specific DOE programs (such as combustion and gasification, and cleanup projects transferred from EPA to DOE) with new project initiates into a coordinated program that addresses cleanup technology development. There are numerous problems associated with using coal to replace oil and gas as a primary fuel. Sulfur, nitrogen, alkali and halogen compounds, and mineral particulate

matter, all found in varying proportions in the domestic coals, are released during gasification and combustion. These contaminants of coal, as well as the soot and tars produced by incomplete combustion or gasification, can potentially degrade the performance of the energy producing system. DOE

N82-16563# Pacific Northwest Lab., Richland, Wash.
ASSESSMENT OF ENVIRONMENTAL HEALTH AND SAFETY ISSUES ASSOCIATED WITH THE COMMERCIALIZATION OF UNCONVENTIONAL GAS RECOVERY: DEVONIAN SHALE
Sep. 1981 88 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001047; PNL-3848) Avail: NTIS HC A05/MF A01

Potential public health and safety issues and the potential environmental impacts from recovery of natural gas from Devonian age shale are identified. The resource and the DOE eastern gas shales project are described. The new and developing recovery technologies associated with Devonian shale are described. An assessment of the environment, health and safety impacts associated with a typical field is presented. The typical field for this assessment occupies ten square miles and is developed on a 40-acre spacing (that is, there is a well in each 40-acre grid). This field thus has a total of 160 wells. Finally, conclusions and recommendations are presented. A reference list is provided to give a greater plant. Based on the estimated plant cost and the various cases of operating income, an economic analysis was performed employing a profitability index criterion of discounted cash flow to determine an interest rate of return on the plant investment. DOE

N82-16564# Gulf Coast Research Lab., Ocean Springs, Miss.
STUDIES ON TOXICITY OF OTEC PLANT COMPONENTS ON MARINE ANIMALS FROM THE GULF OF MEXICO Final Report, 1 Sep. 1978 - 30 Nov. 1980
A. Venkataramiah, G. J. Lakshmi, Christine Best, Gordon Gunter, Eric Hartwig, and Patrick Wilde Jun. 1981 126 p refs Prepared jointly with California Univ., Berkeley. Lawrence Berkeley Lab.
(Contracts DE-AS02-78ET-20512; ET-78-S-02-5071)
(DE81-030167; DOE/ET-20512/T1) Avail: NTIS HC A07/MF A01

Ammonia and chlorine were chosen for toxicity studies as they pose the greatest potential environmental threat. Acute and chronic bioassays determined the LT sub 50 LC sub 50 and the behavior of filefish (Monocanthus hispidus). The chronic bioassays were carried out making in sublethal concentrations of ammonia and chlorine. It is indicated that high concentrations of ammonia and chlorine from the OTEC plants are toxic to marine animals and that the level of toxicity is related to the species, their habitats and life stages. DOE

N82-16565# Urban Systems Research and Engineering, Inc., Cambridge, Mass.
ENERGY AND ENVIRONMENTAL QUALITY: CASE HISTORIES OF IMPACT MANAGEMENT
Jun. 1981 117 p
(Contract DE-AC01-79EV-10012)
(DE81-028435; DOE/EP-10012/1) Avail: NTIS HC A06/MF A01

A discussion of energy source developments and environmental protection dealing with impacts, and legal aspects of pollution controls and resource management, and case history studies of major energy projects is presented. DOE

N82-16566# Argonne National Lab., Ill. Integrated Assessments and Policy Evaluation Group.
PUBLIC HEALTH HAZARDS OF LURGI/FISCHER TROPSCH COAL LIQUEFACTION
J. R. Gasper and S. E. Rosenberg Jan. 1981 63 p refs
(Contract W-31-109-eng-38)
(DE82-001617; ANL-EES-TM-153) Avail: NTIS HC A04/MF A01

The public hazards of wastes from Lurgi/Fischer-Tropsch coal liquefaction were identified. Data on dose response and synergism are not available for many of the waste chemicals from this process. This approach employs two measures of hazards: (1) body burdens that result from exposure to Lurgi/Fischer-Tropsch wastes are compared to body burdens from other sources of the same chemicals; (2) ambient concentrations of pollutants from Lurgi/Fischer-Tropsch operations are projected and compared to various air and water quality standards. DOE

N82-16567# Aerojet Energy Conservation Co., Sacramento, Calif.
COMBUSTION ENHANCEMENT AND POLLUTANT-CONTROL RESEARCH WITH ACOUSTICALLY INDUCED MIXING Technical Progress Report, Jun. - Sep. 1981
R. J. Faeser and M. I. Rudnicki Sep. 1981 31 p
(Contract DE-AC22-80PC-40270)
(DE82-001100; DOE/PC-40270/2) Avail: NTIS HC A03/MF A01

An experimental research program was initiated to evaluate the possibility that beneficial effects can result when acoustic energy is impressed on the combustion zone of pulverized coal furnaces. These benefits include the reduction in NO/sub x/ generation, the increase in combustion intensity, and the increase in turndown ratio (maximum flow/minimum flow). The postulated reason for these possible benefits is the increased relative motion of the gas and coal particles and the fine stirring action resulting from high frequency acoustic waves. During the second, three-month period of this contract, the design and fabrication of the combustor were completed and the test facility buildup was 70% completed. A checkout test of the acoustic equipment and a preliminary acoustic survey test of the combustor response were also completed. DOE

N82-16568# Idaho Univ., Moscow. Dept. of Chemistry.
SULFUR GAS EMISSIONS FROM STORED FLUE GAS DESULFURIZATION SOLIDS Final Report
D. F. Adams Oct. 1981 87 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 856-2)
(DE82-900859; EPRI-EA-2067) Avail: NTIS HC A05/MF A01

The emissions of volatile, sulfur-containing compounds from the surfaces of 13 flue gas desulfurization (FGD) solids field storage sites were characterized. The sulfur gas emissions from these storage surfaces were determined by measuring the sulfur gas enhancement of sulfur-free sweep air passing through a dynamic emission flux chamber placed over selected sampling areas. Samples of the enclosure sweep air were cryogenically concentrated in surface-deactivated Pyrex U traps. Analyses were conducted by wall-coated, open-tubular, capillary column, cryogenic, temperature-programmed gas chromatography using a sulfur-selective flame photometric detector. Several major variables associated with FGD sludge production processes were examined in relation to the measured range and variations in sulfur fluxes including: the sulfur dioxide scrubbing reagent used, sludge sulfite oxidation, unfixed or stabilized (fixed) RGD solids, and ponding or landfill storage. The composition and concentration of the measured sulfur gas emissions were found to vary with the type of solids, the effectiveness of rainwater drainage from the landfill surface, the method of impoundment, and the sulfate/sulfite ratio of the solids. DOE

N82-16569# Du Pont de Nemours (E. I.) and Co., Deepwater, N.J. Chambers Works.
FULL-SCALE DEMONSTRATION OF INDUSTRIAL WASTE-WATER TREATMENT UTILIZING DU PONT'S PACT (TRADE NAME) PROCESS Final Report, Nov. 1976 - Dec. 1979
Harry W. Heath, Jr. Sep. 1981 164 p refs
(Grant EPA-S-804943)
(PB81-248122; EPA-600/2-81-159) Avail: NTIS HC A08/MF A01 CSCL 13B

Operating and cost data on startup and the initial 30 months of operation of 150,000 cu m/day industrial wastewater treatment plant using Du Pont's PACT process are reported. The process effectively provides secondary/tertiary treatment by adding powdered activated carbon to the aerator in an activated sludge process. Removals were consistent even though the waste contained many relatively toxic, nonbiodegradable organics and varied drastically in composition. A synergistic enhancement of biological activity in the presence of activated carbon was observed. Activated carbon was regenerated in a multiple hearth furnace. GRA

N82-16570# Clayton (D. B.) and Associates, Houston, Tex.
CONSERVATION OF COOLING WATER BY SILICA REMOVAL WITH ACTIVATED ALUMINA
Richard Mouche and Jack V. Matson 1980 44 p refs
(Grant NSF PFR-79-17072)
(PB81-247959; NSF/RA-800535) Avail: NTIS HC A03/MF A01 CSCL 13B

Activated alumina which selectively and effectively remove silica from water was investigated. Batch isotherm tests were performed to find out how much silica could be adsorbed by a known quantity of activated alumina and kinetic studies were performing to reveal temperature effects on the rate of adsorption. It is suggested that the sidestream activated alumina process has both environmental and economic benefits over the conventional cooling water systems. GRA

N82-16571# Centec Consultants, Inc., Reston, Va.
ASSESSMENT OF EMERGING TECHNOLOGIES FOR METAL FINISHING POLLUTION CONTROL: THREE CASE STUDIES Final Report, Apr. - Dec. 1980
Philip A. Militello Aug. 1981 74 p refs
(Contract EPA-68-03-2907)
(PB81-244485; EPA-600/2-81-153) Avail: NTIS HC A04/MF A01 CSCL 13B

Approaches to treatment of electroplating wastewater were evaluated. The most promising of these were selected for further investigation to include sampling performance verification, and cost analysis. The treatment methods include a system for treatment of electroplating wastes with ozone, a technique for chrome recovery by ion transfer, and a method of treating mixed wastestreams using ion exchange. Performance of each of these technologies was evaluated through sampling and analysis of prototype operation under normal production conditions. Performance data and cost projections for each system are presented herein. T.M.

N82-16572# North Carolina Water Resources Research Inst., Raleigh.
ON-SITE WASTEWATER TREATMENT PROBLEMS AND ALTERNATIVES FOR WESTERN NORTH CAROLINA
Steven J. Berkowitz Jun. 1981 154 p refs Prepared in cooperation with Univ. of Western Carolina, Cullowhee, N.C.
(PB81-240541; UNC-WRRI-81-163; W81-04661; OWRT-A-999-NC(54)) Avail: NTIS HC A08/MF A01 CSCL 13B

The results of a project intended to help improve wastewater management in the western North Carolina mountains by developing a comprehensive picture of the region's on site wastewater management practices and related problems are summarized. It provides a basis for evaluating the potential role alternative practices and programs could play in solving these problems. Four representative mountain counties--Graham, Haywood, Jackson, and Macon--were analyzed in detail. Approximately 100,000 people live in 40,000 homes within the four study counties. About three quarters of these homes depend on individual wastewater disposal systems, primarily conventional septic tank systems. GRA

N82-16573# Geological Survey, Albany, N.Y. Water Resources Div.
POLYCHLORINATED BIPHENYL TRANSPORT IN THE HUDSON RIVER, NEW YORK Final Water-Resources Investigation, 1976-1977
John T. Turk and David E. Troutman Mar. 1981 18 p refs Prepared in cooperation with Board of Water Commissioners of the Town of Waterford, N.Y. and New York State Dept. of Environmental Conservation
(PB81-249757; USGS/WRD/WRI-81/079; USGS/WRI-81-9) Avail: NTIS HC A02/MF A01 CSCL 13B

The PCB concentrations in the Hudson River at Waterford, New York are controlled by two processes. At discharges that are not extremely high (less than 600 cubic meters per second) a constant flux of PCB's from bottom deposits is the major source. At discharges greater than 600 cubic meters per second, resuspension of bottom materials containing PCB's is the principal mechanism. PCB concentration resulting from either or both processes can be predicted from river discharge by equations developed and verified in this study. The transport rate of PCB's into the Hudson River estuary is approximately 1,700 kilograms per year, of which about 40 percent is transported at discharges greater than 600 cubic meters per second. GRA

N82-16574# Consumer Dynamics, Inc., Rockville, Md.
VOCATIONAL EDUCATION TRAINING IN ENVIRONMENTAL HEALTH SCIENCES: COLLECTING STREAM SAMPLES FOR WATER QUALITY, MODULE 16
Fredric C. May Jul. 1981 43 p refs
(Contract OE-300-80-0088)
(PB81-249690; DE/OVAE-80-0088-16) Avail: NTIS HC A03/MF A01 CSCL 13B

A self-instruction learning package which describes the procedures for collecting stream samples for specific laboratory analyses is presented. Training prerequisites are outlined. GRA

N82-16575# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: WINKLER OXYGEN DATA, EXPANDED WATER COLUMN CHARACTERIZATION CRUISES (XWCC-2 TO SWCC-24), NOAA SHIPS RESEARCHER AND GEORGE B. KELEZ, 1975 - 1979
Antonio Mendez and George A. Berberian May 1981 267 p refs 9 Vol.
(PB82-100975; NOAA-DR-OMPA-2; NOAA-81072212) Avail: NTIS HC A12/MF A01 CSCL 06F

Using the period of February 1975 to August 1979, twenty-three oceanographic cruises were made by the NOAA Ships Researcher and George B. Kelez in the New York Bight. The objective of the cruises was to supply data to provide a base for analysis of the water characteristics and movements, and to provide a baseline to be used in assessing the impacts of contaminants in the New York Bight. This report presents Winkler dissolved oxygen values from samples collected in the New York Bight during Expanded Water Column Characterization cruises (XWCC-2 to XWCC-24) conducted in this period. GRA

N82-16576# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-17), NOAA SHIP GEORGE B. KELEZ, APRIL 1978
John B. Hazelworth, Terren M. Niedrauer, and Philip G. Hanson May 1981 207 p refs 9 Vol.
(PB82-100983; NOAA-DR-OMPA-3; NOAA-81072211) Avail: NTIS HC A10/MF A01 CSCL 06F

During the period 10-18 April 1978, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16577# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT. EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-18), NOAA SHIP GEORGE B. KELEZ, JUN. 1978
John B. Hazelworth, Terren M. Niedrauer, and George A. Berberian May 1981 229 p refs 9 Vol.
(PB82-100991; NOAA-DR-OMPA-4; NOAA-81072210) Avail: NTIS HC A11/MF A01 CSCL 06F

During the period 20 May-9 June 1978, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for anaysis of the water characteristics highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from the cruise. GRA

N82-16578# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARAC-

TERIZATION CRUISE (XWCC-19), NOAA SHIP GEORGE B. KELEZ, JULY 1978
John B. Hazelworth, Terren M. Niedrauer, and George A. Berberian May 1981 247 p refs 9 Vol.
(PB82-101007; NOAA-DR-OMPA-5; NOAA-81072209) Avail: NTIS HC A11/MF A01 CSCL 06F

During the period 5 to 15 July 1978, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16579# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT. EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-20), NOAA SHIP GEORGE B. KELEZ, JULY-AUGUST 1978
John B. Hazelworth and George A. Berberian May 1981 247 p refs 9 Vol.
(PB82-101015; NOAA-DR-OMPA-6; NOAA-81072208) Avail: NTIS HC A11/MF A01 CSCL 06F

During the period 31 July to 9 August 1978, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16580# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-21), NOAA SHIP GEORGE B. KELEZ, APRIL 1979
John B. Hazelworth and George A. Berberian May 1981 227 p refs 9 Vol.
(PB82-101023; NOAA-DR-OMPA-7; NOAA-81072207) Avail: NTIS HC A11/MF A01 CSCL 06F

During the period 9-18 April 1979, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16581# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-22), NOAA SHIP GEORGE B. KELEZ, MAY-JUNE 1979
John B. Hazelworth, George A. Berberian, and Carol Gutherman May 1981 225 p refs
(PB82-101031; NOAA-DR-OMPA-8; NOAA-81072206) Avail: NTIS HC A10/MF A01 CSCL 06F

During the period 29 May - 7 June 1979, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16582# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-23), NOAA SHIP GEORGE B. KELEZ, JULY 1979
John B. Hazelworth, George A. Berberian, and Carol Gutherman May 1981 277 p refs 9 Vol.
(PB82-101049; NOAA-DR-OMPA-9; NOAA-81072205) Avail: NTIS HC A13/MF A01 CSCL 06F

During the period 16 to 27 July 1979, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16583# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
MESA (MARINE ECOSYSTEM ANALYSIS) NEW YORK BIGHT PROJECT: EXPANDED WATER COLUMN CHARACTERIZATION CRUISE (XWCC-24), NOAA SHIP GEORGE B. KELEZ, AUGUST 1979
John B. Hazelworth, George A. Berberian, and Carol Gutherman May 1981 291 p refs 9 Vol.
(PB82-101056; NOAA-DR-OMPA-10; NOAA-81072204) Avail: NTIS HC A13/MF A01 CSCL 06F

During the period 13 to 23 August 1979, an oceanographic cruise was made on the NOAA Ship George B. Kelez in the New York Bight. The objective of the cruise was to supply data to provide a base for analysis of the water characteristics and movements in the highly impacted ecosystem. This report represents the corrected physical and chemical (nutrient) data from this cruise. GRA

N82-16584# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
IMPACT OF TOPOGRAPHIC CIRCULATIONS ON THE TRANSPORT AND DISPERSION OF AIR POLLUTANTS Final Report, Oct. 1978 - Apr. 1981
Roger A. Pielke and Richard T. McNider Aug. 1981 224 p refs
(Contract EPA-R-806207)
(PB82-102435; EPA-600/4-81-068) Avail: NTIS HC A10/MF A01 CSCL 13B

A numerical mesoscale model is utilized to examine slope flows and the classic mountain plain circulation for idealized topography. Special emphasis is given to turbulent parameterization in the stable boundary layer and the unique characteristics of turbulent mixing in the slope flows. A Lagrangian particle model, operating in the terrain following coordinate system of the mesoscale model, was developed to examine pollutant transport in the modeled circulations while a Markov statistical process was used to evaluate turbulent dispersion. Results of dispersion tests in the modeled slope flows showed enhanced vertical dispersion in the slope flows, compared to flow over a flat boundary, and importantly, that normal surface scaling parameters for pollutant dispersion such as friction velocity were inappropriate for the slope flows. GRA

N82-16585# PEDCo-Environmental, Inc., Kansas City, Mo.
FEDERAL INITIATIVE FOR CLEAN AIR: INSPECTION AND MAINTENANCE
Feb. 1981 87 p
(Contract EPA-68-02-2535)
(PB82-102500; EPA-907/9-81-001; PN-3280-V) Avail: NTIS HC A05/MF A01 CSCL 13B

The regulation new car emissions and ensurance that the production of vehicles, if properly maintained, will meet applicable emission standards throughout their useful life is discussed. Inspection/maintenance (I/M) aims at the control of motor vehicle emissions and the reduction of air pollution through required periodic inspection of motor vehicles and maintenance of those that do not pass inspection. It is estimated that a properly operated designed I/M program can reduce auto air pollution emissions by 20 to 30% after several years of program implementation. GRA

N82-16586# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EXHAUST EMISSIONS FROM HIGH-MILEAGE CATALYST-EQUIPPED PASSENGER CARS
Gary T. Jones Jul. 1981 15 p refs
(PB82-103326; EPA-AA-TEB-81-20) Avail: NTIS HC A02/MF A01 CSCL 13B

Vehicles from the 1975 through 1981 model years were

used to examine the effect of 'high mileage' on levels of exhaust emissions. The emission levels from the vehicles involved were examined from four basic views: (1) 'as received' results of the top 15% (by odometer) versus similar results from the bottom 15% and 85%; (2) 'as received' results of vehicles with over 50,000 miles versus those with under 50,000; (3) the effects of restorative maintenance on high mileage vehicles; and (4) the effects of catalyst replacement on high mileage vehicles. The results show that the high mileage vehicles exhibit higher average HC and CO emissions than the lower mileage vehicles. It was also found that on the averge, catalytic converters remain active beyond a vehicle's statutory 'useful life' of 50,000 miles and that restorative maintenance is an effective method to reduce average emission levels. GRA

N82-16587# Environmental Protection Agency, Chicago, Ill. Surveillance and Analysis Div.

ASSESSMENT OF THE REGION V WATER MONITORING ACTIVITIES Final Report

Jan. 1981 179 p

(PB82-103334; EPA-905/4-81-001) Avail: NTIS HC A09/MF A01 CSCL 13B

The water monitoring activities within the region to determine the adequacy of existing monitoring activities to meet program needs are reviewed. The need to develop monitoring capability for toxics and hazardous materials are also reviewed. The changing direction in resource utilization are considered. Findings and recommendations are formulated leading to a monitoring management strategy which results in the coordination of resource utilization and the redirection of monitoring resources needed for a data base. Information on program needs, monitoring program objectives and the assessment of current programs are described. GRA

N82-16588# Environmental Protection Agency, Research Triangle Park, N.C.

AIR POLLUTANTS IN SELECTED SALT LAKE BASIN COMMUNITIES, 1971 - 1975

Gary F. Evans, Peter L. Finkelstein, and Gerald G. Akland Aug. 1981 50 p refs

(PB82-103664; EPA-600/4-81-046) Avail: NTIS HC A03/MF A01 CSCL 13B

Aerometric data are reported for various air pollutants measured by the United States Environmental Protection Agency from 1971 through 1975 in four Utah communities. The communities (Kearns, Magna, Ogden, and Salt Lake City) are situated in or near the Great Salt Lake Basin in which a large copper smelter represented the largest point source of sulfur oxide emissions during the study period. Measurements were made of total suspended particulate, nitrate, sulfate, and sulfur dioxide. In addition to describing the spatial, seasonal, and long term variations in the air quality data, the report includes discussions of related meteorology, quality assurance, and emission data. GRA

N82-16589# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.

CARBON MONOXIDE COMMUTER EXPOSURE DATA BASE: A 5-DAY STUDY IN LOS ANGELES

William B. Peterson, Rodney H. Allen (Comp-Aid, Inc.), Richard A. Ziskind (Science Applications, Inc.), and Michael B. Rogozen (Science Applications, Inc.) Aug. 1981 77 p

(PB82-103607; EPA-600/4-81-069) Avail: NTIS HC A05/MF A01 CSCL 13B

Carbon monoxide exposure to the commuter population was monitored to assess the CO exposure to Los Angeles commuters. Interior carbon monoxide, exterior carbon monoxide and vehicle speed for three vehicles traveling typical commute routes during the morning and evening peak traffic periods were measured. Hourly average CO measurements were taken from eight south coastal air quality management district fixed site monitoring stations and six California transportation agency cans in the proximity of the commuter routes. GRA

N82-16590# National Energy Information Center, Washington, D. C.

NEIC MANUAL FOR GROUNDWATER/SUBSURFACE INVESTIGATIONS AT HAZARDOUS WASTE SITES Final Report

Steven W. Sisk Jul. 1981 213 p refs

(PB82-103755; EPA-330/9-81-002) Avail: NTIS HC A10/MF A01 CSCL 13B

A systematic approach to conducting groundwater/subsurface (hydrogeologic) investigations at hazardous waste sites is presented. The procedures include obtaining background information, inspecting and monitoring the site, and installing monitoring wells. By considering the potential data use in each subject area and the characteristics of the site under study, the investigator determines the types and extent of information required to define a particular pollution problem. Also included are appendices that describe sources of hydrogeologic and other relevant data fundamentals of groundwater hydrology procedures for well drilling and equipment for borehole air sampling. GRA

N82-16591# Atlantic Research Corp., Alexandria, Va.

RESTORING HAZARDOUS SPILL-DAMAGED AREAS: TECHNIQUE IDENTIFICATION/ASSESSMENT Final Report

Randall S. Wentsel, Roberta H. Foutch, William E. Harward, III, William E. Jones, III, and Judith F. Kitchens Sep. 1981 374 p refs

(Contract EPA-68-03-2648)

(PB82-103870; EPA-600/2-81-208) Avail: NTIS HC A16/MF A01 CSCL 13B

The goal of this study was to identify and assess methods that could be used to accelerate the restoration of lands damaged by spills of hazardous materials. The literature was reviewed to determine what response methods had been used in the past to clean up spills on land and identify other techniques that could be developed for detoxification of hazardous, spill-damaged lands. Four biological techniques were evaluated for accelerating the restoration of spill-damaged lands in the laboratory. The techniques and the chemicals used were the following: (1) enhancement of microbial degradation by indigenous for chlorobenzene and ethion organisms; (2) addition of mixed microorganisms from primary sewage for formaldehyde and aniline; (3) addition of adapted/mutant microbial cultures for dinitrophenol and chlordane; and (4) selective absorption by harvestable plants for lead and cadmium. GRA

N82-16592# Mitre Corp., Bedford, Mass.

EVALUATION OF POLLUTION ABATEMENT ALTERNATIVES: PICILLO PROPERTY, COVENTRY, RHODE ISLAND Final Report

Nancy L. Cichowicz, Robert W. Pease, Jr., Paul J. Stoller, and Harold J. Yaffe Sep. 1981 95 p

(Contract EPA-68-01-5051)

(PB82-103888; EPA-600/2-81-186) Avail: NTIS HC A05/MF A01 CSCL 13B

The second phase of an investigation to determine the nature and severity of ground and surface water contamination at the Picillo property in Coventry, Rhode Island is presented. Recommendations for permanent abatement of the situation are made. Bedrock sampling, installation of bedrock wells, field permeability testing, exploratory excavation of drums, ground penetrating radar survey, seismic refraction survey, and collection and chemical analysis of additional soil, ground water, and surface water samples are described. Author

N82-16593# Mitre Corp., Bedford, Mass.

USE OF REMOTE SENSING TECHNIQUES IN A SYSTEMATIC INVESTIGATION OF AN UNCONTROLLED HAZARDOUS WASTE SITE Final Report

Nancy L. Cichowicz, Robert W. Pease, Jr., Paul J. Stoller, and Harold J. Yaffe Sep. 1981 79 p refs

(Contract EPA-68-01-5051)

(PB82-103896; EPA-600/2-81-187) Avail: NTIS HC A05/MF A01 CSCL 13B

The use and evaluation of several remote sensing techniques in conjunction with direct sample collection to develop a systematic approach for subsurface investigations at uncontrolled hazardous waste sites is described. Remote sensing techniques were employed to determine the extent (and sequence) to which they may be integrated with the more conventional methods of test drilling, installation of monitoring wells, and excavation for determining information such as the following: ground water

contamination, presence and number of buried drums, topography and condition of bedrock, and costs and effectiveness of several abatement methods. Both the remote sensing and conventional sampling methods were used at an abandoned hazardous waste dump in Coventry, Rhode Island. GRA

N82-16594# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EMISSION CHARACTERISTICS OF 1979 AND 1980 CALIFORNIA PASSENGER CARS EQUIPPED WITH THREE-WAY CATALYSTS
Gary T. Jones and Matthew M. Macocha Aug. 1981 18 p refs
(PB82-105073; EPA-AA-TEB-81-24) Avail: NTIS HC A02/MF A01 CSCL 13F

Exhaust emissions data gathered on in use vehicles equipped with three way catalyst systems are presented. Information on current systems in customer use for projections on the ability of the three way system to meet emission standards of the future were obtained. It is indicated that vehicles equipped with these systems are capable of achieving low exhaust emission levels although high levels do occur due to defects, deterioration or tampering with the emission control equipment. GRA

N82-16595# Environmental Protection Agency, Ann Arbor, Mich. Emission Control Technology Div.
FUEL ECONOMY AND EXHAUST EMISSIONS OF A METHANOL-FUEL CHEVETTE
H. Anthony Ashby May 1981 7 p refs
(PB82-101783; EPA-AA-TEB-81-23) Avail: NTIS HC A02/MF A01 CSCL 13F

The results of a series of tests conducted over a period of several months on a 1979 Chevrolet Chevette powered by anhydrous methanol are presented. Baseline tests with gasoline were also conducted about three months before the methanol test series began. The exhaust emissions from this car were greatly affected by air-fuel ratio and state of tune. Driveability was not good during most tests when CO met Federal standards. The best optimized adjustments gave a 10 percent better energy efficiency on pure methanol than on gasoline with approximately similar exhaust emission levels. GRA

N82-16596# Southwest Research Inst., San Antonio, Tex.
UNREGULATED EXHAUST EMISSIONS FROM NONCATALYST BASELINE CARS UNDER MALFUNCTION CONDITIONS Final Report, Jun. 1980 - May 1981
Charles Urban May 1981 185 p refs
(Contract EPA-68-03-2884)
(PB82-101130; EPA-460/3-81-020) Avail: NTIS HC A09/MF A01 CSCL 13F

Laboratory efforts to characterize regulated and unregulated exhaust emissions from 1970 model noncatalyst gasoline automobiles operating under malfunction conditions are described. Four automobiles were evaluated over three driving schedules in the unmodified configuration and in up to three engine and/or emission control system malfunction configurations. Exhaust emission constituents measured, in addition to the currently regulated emissions, include: particulates, sulfates, aldehydes, sulfides, amines, metals and several additional elements and compounds. Additional evaluations in each of the configurations involved the measurement of the regulated emissions over four short test procedures. GRA

N82-16597# Southwest Research Inst., San Antonio, Tex.
ESTIMATING MOBILE SOURCE POLLUTANTS IN MICROSCALE EXPOSURE SITUATIONS Final Report, Jan. 1980 - Feb. 1981
Melvin N. Ingalls Jul. 1981 162 p refs
(Contract EPA-68-03-2884)
(PB82-101114; EPA-460/3-81-021) Avail: NTIS HC A08/MF A01 CSCL 13F

The concentration of any vehicle generated pollutant in areas where people are in close proximity to vehicles (microscale exposure situations) was estimated. The situations studied are: residential garages, parking garages, tunnels, street canyons and expressways. For each of the situations dispersion model was selected for use in obtaining pollutant concentrations. The exposure level for each case was determined by calculating the pollutant concentrations for typical and severe actual situations. Actual locations were chosen to represent the typical and severe exposure for each situation. Pollutant concentrations were calculated by using the chosen dispersion models. GRA

N82-16598# APT, Inc., San Diego, Calif.
SPRAY CHARGING AND TRAPPING SCRUBBER FOR FUGITIVE PARTICLE EMISSION CONTROL Final Report, Aug. 1978 - Aug. 1980
Shui-Chow Yung, Julie Curran, and Seymour Calvert Jul. 1981 265 p refs
(Contract EPA-68-02-3109)
(PB82-115304; EPA-600/7-81-125) Avail: NTIS HC A12/MF A01 CSCL 13B

The control of fugitive particle emissions (FPE) with a Spray Charging and Trapping (SCAT) Scrubber that uses an air curtain and/or jets to contain, convey, and divert the FPE into a charged spray scrubber was evaluated. The effects of charge levels on drops and particles, nozzle type, drop size, gas velocity, and liquid/gas ratio on collection efficiency were determined. It is shown that collection efficiency can be improved by charging the water and/or particles. Measured particle penetration agrees with theoretical predictions for the unaugmented scrubber. For the electrostatically augmented scrubber, measured penetration is lower than predicted. An air curtain was developed for conveying the FPE to the spray scrubber. The design and air flow field for the air curtain are presented. GRA

N82-16599# Environmental Protection Agency, Atlanta, Ga. Environmental Impact Statement.
CENTRAL HILLSBOROUGH COUNTY-TAMPA, FLORIDA: 201 FACILITIES PLAN. VOLUME 1: WASTEWATER FACILITIES EXISTING ENVIRONMENT TECHNICAL REFERENCE DOCUMENT
Sep. 1981 373 p refs
(PB82-107913; EPA-904/9-81-078A) Avail: NTIS HC A16/MF A01; also available in set of 3 reports HC E20 as PB82-107897 CSCL 13B

Proposed wastewater facilities for the City of Tampa, the City of Temple Terrace and portions of management alternatives were evaluated with particular attention to the impacts of alternative management systems on growth patterns and primary and secondary impacts on wetlands and other area water resources. Present social, economic, and natural environmental features of the planning area are described. Natural and man made features of the area are documented. GRA

N82-16600# Environmental Protection Agency, Atlanta, Ga. Environmental Impact Statement.
CENTRAL HILLSBOROUGH COUNTY-TAMPA, FLORIDA: 201 FACILITIES PLAN. VOLUME 2: ALTERNATIVES EVALUATION TECHNICAL REFERENCE DOCUMENT
Sep. 1981 211 p refs
(PB82-107921; EPA-904/9-81-078B) Avail: NTIS HC A10/MF A01; also available in set of 3 reports HC E20 as PB82-107897 CSCL 13B

Proposed wastewater facilities for the City of Tampa, the City of Temple Terrace and portions of management alternatives were evaluated. The impacts of alternative management systems on growth patterns and primary and secondary impacts on wetlands and other area water resources are emphasized. GRA

N82-16601# Weston (Roy F.), Inc., West Chester, Pa.
HOURLY DIURNAL FLOW VARIATIONS IN PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES Final Report, 1979
Sep. 1981 122 p refs
(Contract EPA-68-03-2775)
(PB82-107954; EPA-600/2-81-218) Avail: NTIS HC A06/MF A01 CSCL 13B

Sanitary sewer collection systems were surveyed to determine the magnitude of hourly peak flows and to identify parameters most influencing the observed peaks. The significant parameters include: industrial contribution, collection system age, depth to groundwater and low lift preplant pumping stations. Collection systems with larger industrial contributions had higher peak flows than those with small industrial contributions. Variations in peak flows were exhibited between spring and summer periods in

high groundwater and among old age systems due to infiltration during the spring season. Low lift preplant pumping stations create extremely high peak flows and pulses that do not reflect normal diurnal influent flow patterns. GRA

N82-16602# Environmental Protection Agency, Research Triangle Park, N.C. Quality Assurance Div.
A SUMMARY OF THE EPA NATIONAL SOURCE PERFORMANCE AUDIT PROGRAM - 1980 Final Report
R. G. Fuerst, E. W. Streib, and M. R. Midgett Oct. 1981 68 p refs
(PB82-108127; EPA-600/4-81-077) Avail: NTIS HC A04/MF A01 CSCL 13B

A national quality assurance audit program for methods used in stationary source tests was conducted in 1980 by the Quality Assurance Division of the Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. In this program, quality assurance materials were sent to interested participants for the measurement of a gas volume (dry gas meter only) or the analysis of liquid samples simulating collected sulfur dioxide and nitrogen oxides. Each participant returned the analytical results to the Source Branch, Quality Assurance Division, for evaluation. An individual report was returned to each participant after processing. This report summarizes the audit results of 1980 for those three source test methods. GRA

N82-16603# California Univ., Davis. Dept. of Engineering.
PERFORMANCE OF TRICKLING FILTER PLANTS: RELIABILITY, STABILITY, VARIABILITY Final Report
Richard Haugh, Salar Niku, Edward D. Schroeder, and George Tchobanoglous Sep. 1981 111 p refs
(Grant EPA-R-805097)
(PB82-108143; EPA-600/2-81-228) Avail: NTIS HC A06/MF A01 CSCL 13B

Effluent quality variability from trickling filters was examined. Distributions of most effluent data were skewed to the right, and daily suspended solids data exhibited more variation than daily BOD5 data. Three distributions, two parameter empirical, gamma and lognormal were adequate. Daily effluent BOD5 and suspended solids data contained both random and nonrandom components. Effluent BOD and suspended solids concentrations were higher in winter than in summer when pooled data from all plants was examined. Multiple regression analysis determined the effects of various process parameters on effluent quality. Primary effluent BOD5 and suspended solids concentrations and wastewater temperature had the greatest effect. Methods to incorporate statistical concepts into trickling filter design and operation are discussed. GRA

N82-16604# Purdue Univ., Lafayette, Ind.
HEAVY METAL SOURCES AND FLOWS IN A MUNICIPAL SEWAGE SYSTEM: LITERATURE SURVEY AND FIELD INVESTIGATION OF THE KOKOMO, INDIANA SEWAGE SYSTEM Final Report, Oct. 1977 - Jan. 1981
K. J. Yost, R. F. Wukasch, T. G. Adams, and Bert Michalczyk Sep. 1981 282 p refs
(Grant EPA-R-805631)
(PB82-108366; EPA-600/2-81-224) Avail: NTIS HC A13/MF A01 CSCL 13B

The flow of heavy metals (Cu, Ni, Cr, Cd, Zn, PB) and cyanide in the Kokomo, Indiana collection system and wastewater treatment plant was analyzed. The relative contributions of domestic and nondomestic sources to the total pollutant load in the system, were determined. The levels of discharge control required for the disposal of municipal sludge by landfill or agricultural landspreading were assessed. Sampling was conducted at point source locations, in major sewer trunk and feeder lines, and at the treatment plant. Production and waste treatment data are presented for point sources sampled to characterize metal and cyanide discharges as a function of these parameters. GRA

N82-16605# Stanford Univ., Calif. Dept. of Engineering-Economic Systems.
AN APPLICATION OF DECISION ANALYSIS TO TECHNOLOGY ASSESSMENT: AN ASSESSMENT OF DECENTRALIZED WASTE TREATMENT METHODS
Ronald Howard, William Balson, Daniel Owen, Patricia A. Owen, and Gerry Sauer 13 Apr. 1981 157 p refs
(Grant NSF PRA-79-08615)
(PB82-109018; NSF/PRA-81001) Avail: NTIS HC A08/MF A01 CSCL 13B

A technology assessment of waste management systems for individual households is presented. Decisionmaking rather than the prospect of technological advance is assessed. Strategic alternatives for waste treatment, categories of decisionmakers studied, the pollution attributes of waste, and the model and data utilized are outlined. Technical factors in the choice between onsite and central technologies are examined. A decision analysis paradigm and description of the structural model are included. GRA

N82-16606# Enviro Control, Inc., Rockville, Md.
PROCEEDINGS OF THE CONFERENCE ON INNOVATION IN THE ENVIRONMENTAL TECHNOLOGY INDUSTRY
Sep. 1981 3 p refs Conf. held in Washington, D.C., 5-6 Nov. 1980; sponsored in part by Water Pollution Control Federation, Air Pollution Control Association, and Environmental Industry Council
(Contract EPA-68-03-2674)
(PB82-109588; EPA-600/9-81-030) Avail: NTIS HC A02/MF A01 CSCL 13B

Innovation in the environmental technology industry was discussed. Major areas addressed include assessment of pollution control technologies, venture capital constraints and considerations, impact of regulatory policies on new markets and development, Federal patent policy changes and impact on innovation, investment firms perspective for ventures and foreign technology exchange, sources, barriers and approaches. GRA

N82-16607# Environmental Protection Agency, Dallas, Tex.
WASTEWATER TREATMENT FACILITIES, TWINING WATER AND SANITATION DISTRICT, TAOS COUNTY, NEW MEXICO Draft Environmental Impact Statement
Aug. 1981 284 p refs
(PB82-104670; EPA-906/9-81-002) Avail: NTIS HC A13/MF A01 CSCL 13B

The Twining Water and Sanitation District has considered alternatives for wastewater management which would solve a pollution problem in the high-quality Rio Hondo watershed of northern New Mexico. The district proposes construction of a new advanced treatment plant with a capacity of 95,000 gallons per day. A major alternative is to rehabilitate the existing plant and provide only the capacity needed to treat existing wastewater flows (83,000 gallons per day). EPA is considering approval and funding of either alternative (as well as providing no funding). Many complex issues bear on EPA's decision, including impacts on water quality, water supply, and socio-economic conditions. GRA

N82-16608# Surface Technology, Inc., Princeton, N. J.
SURFACE CHEMICAL TECHNOLOGY FOR IMPROVED WETTING OF COAL DUST Open File Report, 13 Sep. 1979 - 13 Sep. 1980
Nathan Feldstein Feb. 1981 50 p refs
(Contract DI-BM-JO-199050)
(PB82-104654; BM-OFR-127-81) Avail: NTIS HC A03/MF A01 CSCL 13B

The wetting of coal dust by aqueous solutions of surface active agents (surfactants) was studied. Thirty coals and typical surfactants were selected. The wetting of the coals was examined by column flow, contact angle, and settling rate measurements. Results indicated that both anionic and nonionic surfactants are to be considered viable for use; low critical micelle concentration values are also preferred for the surfactants. Native waters showed variation in pH, calcium ion concentration, and conductance. Combinations of nonionic and anionic surfactants have, in certain instances, produced synergistic enhancement in the coal wetting superior to the effectiveness of each surfactant alone. GRA

N82-16609# Battelle Columbus Labs., Ohio.
TECHNIQUES FOR HANDLING LANDBORNE SPILLS OF VOLATILE HAZARDOUS SUBSTANCES Final Report
D. Brown, R. Craig, M. Edwards, N. Henderson, and T. J. Thomas Sep. 1981 101 p refs
(Contract EPA-68-02-1323)

(PB82-105230; EPA-600/2-81-207) Avail: NTIS HC A06/MF A01 CSCL 13B

Response needs of teams charged with handling spills of hazardous volatile materials on land are considered. Items of hardware which could be adapted or developed to improve spill response capabilities are suggested. The available technology employed in current spill responses is examined. The phenomena that accompany spill volatilization are assessed to determine and justify physical/chemical mechanisms that could potentially be used to control the hazards arising from volatility. A set of spill scenarios is developed to compare the new suggested technology items with current spill response procedures. GRA

N82-16610# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Chemical and Biochemical Engineering.

OIL SLICK DISPERSAL MECHANICS Final Report

Chukwuka A. Osamor and Robert C. Ahlert Sep. 1981 238 p refs

(Grant EPA-R-805901)

(PB82-105560; EPA-600/2-81-199) Avail: NTIS HC A11/MF A01 CSCL 13B

The spreading and dissolution behavior of small oil slicks formed from spills of 12 oils was investigated. The increases in area covered by the oils during spreading experiments were determined using photographic techniques. The rate of dissolution of the oils in tap water at 25 C were investigated by equilibrating oils with water in open static tests. Limits of solubilities were established for the oils from equilibration in closed vessels. Six oils were also equilibrated with salt water. A segmented mathematical model were derived and used to correlate experimental data. The primary mechanisms are quantified by analogy to homogeneous and heterogeneous catalysis and detergency. Parameters investigated include oil and dispersant types, oil to dispersant ratios, degree of agitation, and the effect of salt water. GRA

N82-16611# Denver Research Inst., Colo.

GEOTHERMAL EFFLUENT SAMPLING WORKSHOP Final Report

Jul. 1981 60 p Workshop held in Denver, May 1980

(Grant EPA-R-807469)

(PB82-105628; EPA-600/4-81-051) Avail: NTIS HC A04/MF A01 CSCL 13B

Recommendations to identify gaps in existing geothermal effluent sampling methodologies define needed research to fill those gaps, and recommend strategies to lead to a standardized sampling methodology are outlined. Topics discussed are: gas sampling; two phase gas sampling; liquid sampling; quality control/assurance. GRA

N82-16612# Jones and Stokes Associates, Inc., Sacramento, Calif.

WASTEWATER MANAGEMENT PLAN FOR THE LAKE WASHINGTON/GREEN RIVER BASINS Final Environmental Impact Statement

Roger Mochnick Seattle, Wash. EPA Aug. 1981 529 p refs

(PB82-105982; EPA-910/9-80-077F) Avail: NTIS HC A23/MF A01 CSCL 13B

The EPA proposes to approve for federal funding a long term wastewater management plan for the Renton study area. The program includes expansion of the Renton treatment plant's capacity, and construction of a tunnel and outfall for treated discharge into Puget Sound. Of the two locations considered for the outfall, Alki Point has been chosen as environmentally preferable over Seahurst Park. EPA also recommends additional studies on the design of the selected route, as well as on the monitoring procedure for the outfall and Puget Sound water quality conditions. GRA

N82-16613# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.

DEMONSTRATION OF A LONG-RANGE ATMOSPHERIC TRACER SYSTEM USING PERFLUOROCARBONS

Gilbert J. Ferber, Kosta Telegadas, Jerome L. Heffter, C. Ray Dickson, Russell N. Dietz, and Philip W. Krey Apr. 1981 84 p refs

(Contract DE-AI01-80EV-10081)

(PB82-106246; NOAA-TM-ERL-ARL-101; NOAA-81080301) Avail: NTIS HC A05/MF A01 CSCL 13B

Regional-scale tracer experiments are needed to validate atmospheric dispersion aspects of air pollution models. The capability of a new system, using perfluorocarbon tracers (PFTs), for long-range dispersion experiments at reasonable cost was demonstrated in two experiments. Two PFTs (C7F14 and C8F16) were released simultaneously with SF6 and two heavy methanes. The PFT system provides automatic sequential samplers and rapid, inexpensive analyses down to 2 parts per 10 to the + 15th power of air. PFT concentrations were measured 600 km away, up to three days after release. Performance of the PFT system was excellent and a consistent set of tracer data was obtained. GRA

N82-16614# Bureau of Mines, Salt Lake City, Utah.

HYDROGEN SULFIDE GENERATION BY REACTION OF NATURAL GAS, SULFUR AND STEAM Report of Investigations, Jul. 1981

S. R. Crane, Laird Crocker, and W. I. Nissen Jul. 1981 61 p refs

(PB82-106998; BM-RI-8539) Avail: NTIS HC A04/MF A01 CSCL 13B

A regenerable flue gas desulfurization process was developed. The citrate process uses a buffered weak acid solution to absorb SO2 from the waste gas. The absorbed SO2 is reacted with H2S to precipitate elemental sulfur and regenerate the solution for recycle. The H2S feedstock xor the process may be produced by reacting two-thirds of the recovered elemental sulfur with natural gas and steam. Laboratory investigations and pilot plant operations were conducted by the Bureau to determine if H2S from the natural gas, sulfur, and steam reaction was suitable for the citrate process. The laboratory investigations, in which an H2S generator was integrated with other citrate process operations, provided a basis for design and operation of the pilot plant. The objective was to provide H2S for citrate process pilot plant. GRA

N82-16615# Calspan Corp., Buffalo, N. Y.

GUIDELINES FOR THE USE OF CHEMICALS IN REMOVING HAZARDOUS SUBSTANCE DISCHARGES

C. K. Akers, R. J. Pilie, and J. G. Michalovic Sep. 1981 82 p refs

(Contract EPA-68-03-2093)

(PB82-107483; EPA-600/2-81-205) Avail: NTIS HC A05/MF A01 CSCL 13B

Guidelines were developed on the use of various chemical and biological agents to mitigate discharge of hazardous substances. Eight categories of mitigative agents and their potential uses in removing hazardous substances discharged on land and in waterways are discussed. The agents are classified as follows: (1) Mass Transfer Media; (2) Absorbents; (3) Thickening and Gelling Agents; (4) Biological Treatment Agents; (5) Dispersing Agents; (6) Precipitating Agents; (7) Neutralizing Agents; and (8) Oxidizing Agents. The classification of each agent is developed in terms of: (a) Characteristic properties of the mitigative agent; (b) Potential spill situations on which the agent could be used; (c) The effects on the environment caused by use of the agent; (d) Possible toxic side effects caused by byproduct formation; and (e) Recommendations for use of the agent. GRA

N82-16616# SCS Engineers, Reston, Va.

EVALUATION OF ON-SITE WASTEWATER TREATMENT AND DISPOSAL OPTIONS Final Report, Oct. 1977 - Oct. 1978

David H. Bauer, E. T. Conrad, and Donald G. Sherman Sep. 1981 234 p refs

(Contract EPA-68-03-2627)

(PB82-101635; EPA-600/2-81-178) Avail: NTIS HC A11/MF A01 CSCL 13B

Conceivable alternatives of on site systems, wastewater manipulation, treatment and disposal options were identified. Wastewater manipulation includes flow reduction, wasteload reduction and waste segregation. Treatment options include disinfection, biological, and physical/chemical methods. Disposal options included air, soil and surface water methods, and practical combinations. An equipment inventory to determine the availability

of hardware for the systems and system components was performed. Performance, operation and maintenance, environmental acceptability, and total annual cost for 15 specific site conditions were evaluated. Site conditions are defined by soil percolation rate, soil depth, slope, available land area, direct discharge effluent requirements, and net evaporation. GRA

N82-16617# Pittsburg Univ., Pa.
PENNSYLVANIA BASELINE
Maurice A. Shapiro, ed. Apr. 1981 632 p refs
(Grant EPA-R-805608)
(PB82-101742; EPA-600/7-81-059) Avail: NTIS HC A99/MF A01 CSCL 06F

This was prepared as part of the Ohio River Basin Energy Study (ORBES), a multidisciplinary policy research program supported by the Environmental Protection Agency. Its purpose is to provide baseline information on Pennsylvania, one of the six states included partly or totally in the ORBES region. The topics covered are a historical synopsis of human activities in western Pennsylvania; geology, climatology, and soils; terrestrial ecology; surface hydrology; water quality; aquatic ecology; and socioeconomic characteristics. GRA

N82-16618# Versar, Inc., Springfield, Va.
ENVIRONMENTAL ASSESSMENT, SOURCE TEST AND EVALUATION REPORT: COAL PREPARATION PLANT NO. 2 Final Report, Sep. 1979 - Mar. 1981
J. Buroff, J. Strauss, A. Jung, and L. McGilvray Apr. 1981 304 p refs
(Contract EPA-68-02-3136)
(PB82-103573; EPA-600/7-81-071B) Avail: NTIS HC A14/MF A01 CSCL 06F

Results and conclusions are given of a source test and evaluation program at a coal preparation plant, representing cleaning plants that process run of mine coal with high pyritic sulfur content, use high technology coal cleaning processes, operate in a high rainfall environment, and have a low soil neutralization potential. The major objective of the program was to perform an environmental assessment on the plant's waste streams and fugitive emissions. Chemical analysis results indicated that all streams, except fugitive particulates, contained constituents which may have a potentially harmful health and/or ecological effect. For streams showing potential for ecological effects, Mn was of concern for streams showing a potentially harmful health effect, Mn and Or were of prime concern. Contrary to previous studies, high Ni-13 concentrations were observed in the leachate. Further investigation of the Ni-13 source is warranted. Bioassays for fugitive particulates, sedimentation pond waters, and fine refuse slurry solid samples indicated moderate biological effects. GRA

N82-16619# Camp, Dresser and McKee, Inc., Boston, Mass.
DENSITY LEVELS OF PATHOGENIC ORGANISMS IN MUNICIPAL WASTEWATER SLUDGE, A LITERATURE REVIEW Final Report
Dana C. Pedersen Sep. 1981 298 p refs
(Contract EPA-68-03-2803)
(PB82-102286; EPA-600/2-81-170) Avail: NTIS HC A13/MF A01 CSCL 13B

Density levels of indicator and pathogenic organisms in municipal wastewater sludges and septage were examined. The effectiveness of conventional municipal sludge stabilization processes (mesophilic anaerobic and aerobic digestion, composting and lime stabilization) and dewatering processes (drying beds, lagooning/storage, and sludge conditioning/mechanical dewatering) was evaluated for reducing density levels of indicator and pathogenic organisms. All literature published on this topic between 1940 and 1980 was reviewed. An annotated bibliography presents all citations reviewed, with pertinent abstracts and methods used by researchers. GRA

N82-16620# Camp, Dresser and McKee, Inc., Boston, Mass.
ENGINEERING AND ECONOMIC ASSESSMENT OF AUTOHEATED THERMOPHILIC AEROBIC DIGESTION WITH AIR AERATION Final Report
Sep. 1981 48 p refs
(Contract EPA-68-03-2803)
(PB82-102310; EPA-600/2-81-171) Avail: NTIS HC A03/MF A01 CSCL 13B

A major disadvantage of aerobic digestion is that it requires long detention times, particularly in colder climates, to insure adequate stabilization. Autoheated thermophilic aerobic digestion (ATAD) offers the potential to decrease the required detention time. ATAD takes advantage of the heat generated by microorganisms as they degrade organic material. Heat losses are controlled so that the system will be self heating (authothermal) and reach thermophilic range (at least 45 C). ATAD is shown to be feasible with a mixture of thickened waste activated and primary municipal sludge. ATAD systems appear economical compared with ambient aerobic digestion and anaerobic digestion. The system is also more effective in decreasing the pathogen content of sludge. T.M.

N82-16621# Los Angeles County Sanitation District, Whittier, Calif.
WASTEWATER DECHLORINATION STATE-OF-THE-ART FIELD SURVEY AND PILOT STUDIES Final Report, Jun. 1973 - Sep. 1979
Ching-Lin Chen and Henry B. Gan Sep. 1981 104 p refs
(Contracts EPA-14-12-150; EPA-68-03-2745)
(PB82-102336; EPA-600/2-81-169) Avail: NTIS HC A06/MF A01 CSCL 13B

The utility and efficiency of the sulfur dioxide method was determined and a cost-effectiveness comparison of sulfur dioxide and two other methods of dechlorination, namely, activated carbon and holding tank processes is provided. Pilot-scale testing indicates that no degradation of physical and chemical water quality occurred in the dechlorinated effluents from any of the three dechlorination processes investigated. The field survey involved the canvassing of 55 operating plants and although overdosing of sulfur dioxide was frequently necessary to meet the residual chlorine discharge standards, most installations found pH adjustment and reaeration of the dechlorinated effluent unnecessary. Process cost estimates indicate that sulfur dioxide process is the most cost-effective method for dechlorination. T.M.

N82-16622# Tulane Univ., New Orleans, La. School of Public Health and Tropical Medicine.
PARASITES IN SOUTHERN SLUDGES AND DISINFECTION BY STANDARD SLUDGE TREATMENT
R. S. Reimers, M. D. Little, A. J. Englande, D. B. Leftwich, D. D. Bowman, and R. F. Wilkinson Sep. 1981 203 p refs
(Grant EPA-R-805107)
(PB82-102344; EPA-600/2-81-166) Avail: NTIS HC A10/MF A01 CSCL 13B

The inactivation of parasites by lime stabilization of sewage sludges seeded with selected intestinal parasites was investigated. Sludge samples examined in each of the four seasons from 27 municipal wastewater treatment plants indicated the following: viable eggs of Ascaris and Toxocara were observed at least once from every plant; viable eggs of T. vulpis and T. trichiura were observed at least once from 26 and 15 plants, respectively, and viable eggs of at least 10 other helminths and cysts of a few protozoa were observed in fewer numbers and less frequently. Certain drying bed conditions such as previous sludge stabilization, high temperature, and low moisture content appear to inactivate parasite eggs synergistically between 60 percent to 5 percent sludge moisture content. Laboratory studies indicate that destruction of resistant parasite eggs is primarily due to temperature and not to a specific digestion process. T.M.

N82-16623# Acurex Corp., Mountain View, Calif. Energy and Environment Div.
FUEL NOx CONTROL BY CATALYTIC COMBUSTION Final Report, Oct. 1978 - Apr. 1979
E. K. Chu, K. D. Seifert, R. M. Kendall, and J. P. Kesselring Sep. 1981 103 p refs
(Contract EPA-68-02-2611)
(PB82-102351; EPA-600/7-81-151; IERL-RTP-1247) Avail: NTIS HC A06/MF A01 CSCL 13B

Operating conditions for catalytic combustors that give low levels of NOx emissions for fuel-bound nitrogen compounds were defined, and fuel nitrogen during catalytic combustor was determined. Fuel NOx emissions are strongly dependent on catalyst type; however, varying mass throughput, bed temperature, fuel, and fuel nitrogen type had virtually no effect on fuel NOx. The

dominant nitrogenous products resulting from the catalytic combustion of a nitrogen containing fuel were NO, N2, NH3, and HCN. GRA

N82-16624# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
SIMPLIFIED NOISE STRATEGY MANUAL
Mones E. Hawley Jul. 1981 98 p refs
(Contract EPA-68-01-4944)
(PB81-243016) Avail: NTIS HC A05/MF A01 CSCL 13B

A manual system for planning the noise control strategy for abating a community's noise problems is described. It assists communities in determining, in an objective manner, the efficient allocation of funds for reducing the adverse effects of noise in their community. A noise planner is assisted in selecting the most cost effective noise abatement measures and the amount of money which should be spent on each. The primary criterion for optimization is based on economic and acoustical data gathered in the community. GRA

N82-16625# Michigan Univ., Ann Arbor. Seagrant Program.
POLLUTION PROBLEMS OF THE GREAT LAKES REGION. REPORT OF THE GREAT LAKES REGION CONFERENCE
Russel Moll, ed., Suzanne Tainter, ed., and Stephen R. Schneider, ed. Jan. 1981 74 p refs Conf. held at Traverse City, Mich., 9-11 Jun. 1981
(PB81-246951; UMICH-SG-81-900; NOAA-81070804; Working-Paper-3) Avail: NTIS HC A04/MF A01 CSCL 08H

The most important pollution problems of the Great Lakes were identified. Important problem areas are: the impact of pollutants of human health, the impact of pollutants on overall ecosystem health, the longevity or reversibility of the consequences of the pollutant, the areal extent of the pollutant, and the future magnitude of the problem. Topics discussed are: food and fiber production water uses; industrial water uses; municipal water uses; recreation and wildlife water uses; social, economic and institutional water uses; and transportation water uses. GRA

N82-16626# Temple Univ., Philadelphia, Pa. Inst. of Survey Research.
COMMUNITY NOISE ATTITUDINAL SURVEY GUIDELINES
Jul. 1981 147 p
(Contract EPA-68-01-3840)
(PB81-244295) Avail: NTIS HC A07/MF A01 CSCL 13B

The community noise assessment manual provides a comprehensive and computerized system for assessing the noise problems of a community and then planning a noise control strategy for its abatement. This report provides a procedure for implementing a survey of people's attitudes toward noise. An attitudinal questionnaire to be administered to city residents is provided. The procedures for using a probability sampling techniques to estimate the characteristics of the population are provided and a method for analyzing the collected data is discussed. GRA

N82-16627# Geological Survey, Albany, N.Y. Water Resources Div.
RELATIONSHIP OF WATER QUALITY OF HUDSON RIVER, NEW YORK DURING PEAK DISCHARGES TO GEOLOGIC CHARACTERISTICS OF CONTRIBUTING SUBBASINS Final Report, 1977 - 1979
John T. Turk and David E. Troutman 1981 22 p refs Prepared jointly with Board of Commissioners of the Town of Waterford, N.Y. and New York State Dept. of Environmental Conservation
(PB81-249740; USGS/WRD/WRI-81-078; USGS/WRI-80-108) Avail: NTIS HC A02/MF A01 CSCL 08H

Water samples from two Hudson River floods in 1977, one originating mainly in shale subbasins that produce high sediment loads, the other in soil poor, crystalline rock terrain that yields little sediment, were analyzed to evaluate the relationship of iron, manganese, lead, phosphorus, and polychlorinated biplanyis (PCB's) to suspended sediment concentration. During the flood of high sediment discharge, ratios for all substances studied except PCB's reflected their concentration within the basin regolith. During the flood of smaller magnitude, from the low sediment crystalline terrain, however, only the ratio for iron correlated with predicted concentrations in the basin, which suggests that the chemical constituents studied were contributed principally from other sources, possibly antropogenic sources. GRA

N82-16628# Environmental Protection Agency, Washington, D.C. Facilities Requirements Div.
OPERATION AND MAINTENANCE COSTS FOR MUNICIPAL WASTEWATER FACILITIES
Sep. 1981 140 p refs
(PB81-249971; EPA-430/9-81-004; FRD-22) Avail: NTIS HC A07/MF A01 CSCL 13B

The results of the latest and most comprehensive effort to obtain and analyze operation and maintenance costs for wastewater treatment works are presented. Data from more than 900 treatment plants and almost 500 conveyance systems throughout 40 of the 48 contiguous United States, including all ten EPA regions is summarized. Included is information on administrative costs, sludge handling costs, and staffing. Basic information from site visits was combined into a simple data base and examined for relationships between total operation and maintenance costs, facility design parameters, and plant operation parameters. These relationships were developed for the general national level and, where possible, for smaller geographic units. Where appropriate in analyzing the data, total operation and maintenance costs were reduced to their major components. GRA

N82-16629# Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
COMPOSTING PROCESSES TO STABILIZE AND DISINFECT MUNICIPAL SEWAGE SLUDGE
Jul. 1981 55 p
(PB81-240509; EPA-430/9-81-011; EPA/MCD-79) Avail: NTIS HC A04/MF A01 CSCL 13B

The design and operation of sewage sludge compositing facilities is discussed. Operational procedures and performance levels related to the composting facilities are given. The performance levels recommended are flexible enough to allow for innovation in composing system designs. The recommendations will assure that adequate sludge stabilization and disinfection (pathogen reduction) are achieved. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-16630# Office of Technology Assessment, Washington, D. C.
CRITERIA FOR EVALUATING THE IMPLEMENTATION PLAN REQUIRED BY THE EARTHQUAKE HAZARDS REDUCTION ACT OF 1977
1980 79 p
(PB81-241663; OTA-BP-X-2) Copyright. Avail: Issuing Activity CSCL 08K

The Earthquake Hazards Reduction Act of 1977 which proposes to reduce the risk to life and property from future earthquakes by establishing and maintaining an earthquake hazards reduction program is discussed. The Act also required that an implementation plan be submitted to Congress within 210 days of enactment. Fourteen basic issues or conflicts with which the implementation plan must cope in order to achieve its objectives are identified. These issues and the associated questions developed under each of them in the text comprise criteria which may be useful to Congress in its evaluation of the plan. GRA

N82-16631# Committee on Science and Technology (U. S. House).
EARTHQUAKE HAZARDS REDUCTION PROGRAM AND FIRE PREVENTION AND CONTROL PROGRAM
Washington GPO 1981 51 p Rept. to accompany H. R. 3356 presented by the Comm. on Sci. and Technol. and the Comm. on Interior an Insular Affairs at the 97th Congr., 1st Sess., 30 Apr. 1981

(GPO-78-756; H-Rept-97-59-Pt-2) Avail: US Capitol, House Document Room

The bill to amend the Earthquake Hazards Reduction Act of 1977 and the Federal Fire Prevention and Control Act of 1974 was reviewed. The bill authorizes the appropriation of funds to carry out the earthquake hazards reductions program and the fire prevention and control program. It was recommended that the bill be passed without amendment. S.L.

N82-16632# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

IONOSPHERIC DISTURBANCES PROPAGATING EASTWARD IN A LOW LATITUDE DETECTED BY VHF POLARIMETERS

I. J. Kantor, M. A. Abdu, and I. S. Batista Aug. 1981 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 33d Reuniao Anal da SBPC, Salvador, Jul. 1981

(INPE-2202-PRE/011) Avail: NTIS HC A02/MF A01

Simultaneous measurements of the total electron content (TEC) through observations of the Faraday rotation angle of vhf signals transmitted by the GOES-1 geostationary satellite, using polarimeters located at Sao Jose dos Campos geographic coordinates (23 deg S, 46 deg W) and Cachoeira Paulista geographic coordinates (23 deg S, 45 deg W), show disurbances in TEC propagating eastward. These disturbances occur especially in the period between sunset and midnight and are associated with spread F as detected in the Cachoeira Paulista ionograms. Statistics of these events, their velocities and their association with equatorial spread F are presented. T.M.

N82-16633# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NUMERICAL SIMULATION OF RAYLEIGH-TAYLOR INSTABILITY IN THE EQUATORIAL IONOSPHERIC PLASMA [SIMULACAO NUMERICA DA INSTABILIDADE RALYEIGH-TAYLOR NO PLASMA IONOSFERICO EQUATORIAL]

Y. Nakamura, J. H. A. Sobral, and M. A. Abdu Jul. 1981 28 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Reuniao Anual da SBPC, Salvador, Brazil, 1981

(INPE-2172-RPE/388) Avail: NTIS HC A03/MF A01

Ionospheric irregularities near the magnetic equator are studied. A numerical simulation is done for the generation and evolution of the ionospheric bubble based on the theory of the collisional Rayleigh-Taylor instability for two fluids, for the magnetic equatorial region. The regions of depletion in density were assumed to be aligned with the Earth's magnetic field, extending from higher altitudes at the equatorial region down to the arbitrary height of 150 km. Assuming the electron density profile perturbed by the bubble, the 6300 A intensity was calculated for various latitudes arbitrarily taken within the photometer scanning range. The calculated airglow results show that, as the bubble moves upward, the disturbance in the airglow intensity propagate from north to south, in agreement with observed results. Author

N82-16634*# Alaska Univ., Fairbanks. Geophysical Inst.

NUMERICAL SIMULATION OF THE INTERACTION OF THE PLASMA SHEET WITH THE LOBES OF THE EARTH'S MAGNETOTAIL

Daniel W. Swift [1982] 46 p refs

(Grants NsG-7625; NSF AM-79-23614)

(NASA-CR-168508) Avail: NTIS HC A03/MF A01 CSCL 04A

Codes involving one and two spatial dimensions and three velocity dimensions were used to model the Earth's magnetotail. It was shown that the magnetotail can become inflated as a consequence of low energy plasma convection toward the neutral plane. The computer study exhibits a conversion of both magnetic field energy and of energy supplied by the convection electric field into particle energy. The numerical simulations suggest that much of the magnetotail substorm morphology may be a simple consequence of an increase, followed by a decrease, in the convection electric field, without the requirement of any magnetospheric size scale plasma instability or other disruptive processes. It is also concluded that the presence of the convection electric field and a continuing replenishment of low energy particles in the magnetotail are both necessary for maintenance of the magnetotail. M.D.K.

N82-16635*# California Univ., Berkeley. Space Sciences Lab.

DOUBLE LAYERS ON AURORAL FIELD LINES

M. K. Hudson, W. Lotko, and E. Witt [1982] 22 p refs

(Grant NAGw-75)

(NASA-CR-165113) Avail: NTIS HC A02/MF A01 CSCL 04A

Time-stationary solutions to the Vlasov-Poisson equation for ion holes and double layers were examined along with particle simulations which pertain to recent observations of small amplitude (e phi)/t sub e approx. 1 electric field structures on auroral field lines. Both the time-stationary analysis and the simulations suggest that double layers evolve from holes in ion phase space when their amplitude reaches (e phi)/t sub e approx. 1. Multiple small amplitude double layers which are seen in long simulation systems and are seen to propagate past spacecraft may account for the acceleration of plasma sheet electrons to produce the discrete aurora. T.M.

N82-16636*# Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).

DYNAMICS OF MAGNETOSPHERE-IONOSPHERE COUPLING INCLUDING TURBULENT TRANSPORT

Robert L. Lysak and Christian T. Dum [1982] 4 p refs

(Grant NAGw-75)

(NASA-CR-165098) Avail: NTIS HC A02/MF A01 CSCL 04A

A two dimensional two-fluid MHD model including anomalous resistivity was used to investigate the dynamics of magnetosphere-ionosphere coupling. When a field-aligned current is generated on auroral field lines, the disturbance propagates towards the ionosphere in the form of a kinetic Alfven wave. When the current exceeds a critical value, microscopic turbulence is produced, which modifies the propagation of the Alfven wave. This process is modeled by a nonlinear collision frequency, which increases with the excess of the drift velocity over the critical value. Turbulence leads to absorption and reflection of the Alfven wave, partially decoupling the generator from the ionosphere. The approach to a steady-state is strongly dependent on the presence or absence of the turbulence. The current is self-limiting, since a current in excess of critical causes a diffusion of the magnetic field perturbation and a reduction of current. Author

N82-16637*# Ohio State Univ., Columbus.

PREDICTION OF EARTH ROTATION AND POLAR MOTION

Sheng Yuan Zhu Sep. 1981 39 p refs

(Grant NsG-5265)

(NASA-CR-163468; Rept-320) Avail: NTIS HC A03/MF A01 CSCL 08E

Based on the analysis of the polar motion behavior, the possibility of predicting polar motion up to one year in advance was found. Comparing these predicted polar coordinates with the observed ones (smoothed), the root mean square (rms) of the differences is about 0.02 seconds. The differences of the relative polar motion are much smaller. For any time interval of 20 to 30 days throughout the whole year, the rms of the relative polar motion differences is about 0.01 second. Compared with the best available VLBI results (from 1977 to 1980), the rms of pred. to obs. is 0.013 seconds, and the relative rms (for time intervals less than two months) is 0.008 seconds (here the observed data is unsmoothed). It appears that 80 to 90% of the polar motion is composed of the stable, predictable Chandler and annual terms. The UT1-UTC has more complicated changes than polar motion making it difficult to find a satisfactory method of long term prediction. So far the rms prediction error is 0.0023 s for up to 30 days. N.W.

N82-16638# Photometrics, Inc., Woburn, Mass.

DETERMINATION OF UPPER ATMOSPHERIC WINDS AND TURBULENT DIFFUSION AND DISSIPATION FROM ARTIFICIAL CLOUD EXPANSION AND GROWTH Final Report, 22 Jun. 1978 - 21 Jun. 1981

Christian A. Trowbridge 22 Jul. 1981 27 p refs

(Contract F19628-78-C-0171; AF Proj. 6690)

(AD-A106387; PHM-04-81; AFGL-TR-81-0200) Avail: NTIS HC A03/MF A01 CSCL 04/1

Microdensitometric reduction and computer analysis were

applied in analyzing radiometrically and photogrammetrically calibrated photographic images of chemical and particulate tracers in the stratosphere, mesosphere and thermosphere. Digitized optical density distributions were processed by Fourier and configuration space analyses to determine turbulent atmospheric heating rates, diffusion coefficients, and other parameters descriptive of upper-atmospheric turbulence. Richardson numbers, heating, and turbulent diffusivity were also determined from wind data derived by the smoke trail method. Author (GRA)

N82-16639# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.

USE OF BACK AZIMUTH MEASUREMENTS IN SEISMIC EVENT LOCATION WITH REGIONAL DATA

D. W. Rivers, J. A. Burnetti, and A. C. Chang Alexandria, Va. VELA Seismic Center 9 Jan. 1981 84 p refs

(Contract F08606-79-C-0007; DARPA Order 2551)

(AD-A106429; SDAC-TR-81-3; VSG-TR-81-17) Avail: NTIS HC A05/MF A01 CSCL 17/1

Conventional methods for seismic event location, which are based on measurements of signal arrival times, may be inadequate for events detected at only regional distances, because there may be an insufficient number of observations. This shortcoming can be alleviated by supplementing the measurements of P-wave arrival times with measurements of the event's back azimuth made by applying Smart's (1978) three-component processor to the regional phase Lg. Back azimuth measurements can also be used as an analyst's tool to calculate an approximate epicenter for use in the association of mixed events with the appropriate signal arrivals or for use as the initial value in an iterative location scheme. An algorithm is herein presented which performs event location by treating arrival time measurements and back azimuth measurements in an analogous fashion. Tests of this algorithm which were run in the depth-restrained mode for two events show that it can be effective for sparse data sets but also that it can lead to large errors if there is a poor geometrical distribution of detecting stations. Computations of the confidence region about the epicenter demonstrates an insufficiency in the theory for calculating F-statistic confidence ellipses for azimuths and travel-time data if the measurement variances are not known a priori. The theory is satisfactory for the standard chi-squared ellipses. Author (GRA)

N82-16640# University Coll., London (England). Dept. of Physics and Astronomy.

TROPOSPHERIC: STRATOSPHERIC TIDAL INVESTIGATIONS. PART 3: HOUGH COMPONENTS OF SURFACE PRESSURE Final Scientific Report, 1 Dec. 1976 - 30 Sep. 1981

Gerald V. Groves and A. Wilsch 31 Aug. 1981 50 p refs

(Grant AF-AFOSR-3224-77; AF Proj. 6687)

(AD-A106386; AFGL-TR-81-0301) Avail: NTIS HC A03/MF A01 CSCL 04/1

The report contains two papers. In the first of these, diurnal and semidiurnal Hough components of surface pressure are evaluated by classical tidal theory for previously presented profiles of water vapour and ozone heating and the values obtained are compared with the observed results of Haurwitz and Cowley (1973). The second paper presents profiles of terdiurnal ozone and water vapour heating from which the corresponding surface pressure oscillations are evaluated by classical tidal theory and compared with earlier evaluations and observationally derived results. In both papers the calculations underpredict the observed values and indicate a need for additional tidal heating to be identified. Author (GRA)

N82-16641# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

GRAVITATIONAL AGGLOMERATION OF POST-HCDA LMFBR NONSPHERICAL AEROSOLS Ph.D. Thesis - Missouri Univ. - Rolla

Ronald Forrester Tuttle Dec. 1980 274 p refs

(AD-A106766; AFIT-CI-80-82D) Avail: NTIS HC A12/MF A01 CSCL 13/7

A theoretical investigation of collisional dynamics of two particle interactions in a gravitational field is reported. This research is unique in that it is the first attempt at modeling the hydrodynamic interactions between a nonspherical particle and a spherical particle undergoing gravitational collisions in an LMFBR environment. Basic definitions and expressions are developed for nonspherical particles and related to spherical particles by means of shape factors. Using volume equivalent diameter as the defining length in the gravitational collision kernel, the aerodynamic shape factor, k, the density correction factor, alpha, and the gravitational collision shape factor, beta, are used to correct the collision kernel for the case of collisions between aerosol agglomerates. The Navier-Stokes equation in oblate spheroidal coordinates is solved to model a nonspherical particle and then the dynamic equations for two particle motions are developed. A computer program NGCEFF is constructed, the Navier-Stokes equation is solved by the finite difference method, and the dynamical equations are solved by Gear's method. It is concluded that the aerosol gravitational collision shape factor can be determined by further theoretical work based on the concepts and methods developed in this dissertation. GRA

N82-16642# California Univ., Berkeley. Space Sciences Lab.

VECTOR ELECTRIC FIELDS Final Report, 1 Oct. 1974 - 30 Sep. 1980

Forrest S. Mozer 29 Sep. 1981 5 p refs

(Contract N00014-75-C-0294)

(AD-A106784) Avail: NTIS HC A02/MF A01 CSCL 04/1

Funds provided by this contract were used to design and build the first electric field experiment that has successfully measured magnetospheric electric fields above the ionosphere, and to analyze the electric field data thereby obtained. The instrument was flown into an elliptical polar orbit on the S3-3 satellite where it made measurements for about two years following its July, 1977 launch. The S3-3 satellite was, perhaps, the most important magnetospheric satellite launched in the past decade, since it discovered and studied the low altitude particle acceleration region that produces discrete auroral arcs and much of the magnetospheric energetic ion population. During the period of this contract, twenty-one scientific papers were written on these topics, invited papers were presented at an additional twelve meetings. In the year following termination of this contract, an additional eleven scientific papers have been either published or submitted for publication. A bibliography of these publications is attached. Author (GRA)

N82-16643# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

THE ROLE OF HISS IN MAGNETOSPHERIC CHORUS EMISSIONS

Harry C. Koons 28 Sep. 1981 54 p refs

(Contract F04701-80-C-0081; Grant NSF ATM-80-19060)

(AD-A106479; TR-0081(6960-06)-10; SD-TR-81-77) Avail: NTIS HC A04/MF A01 CSCL 04/1

The simultaneous presence of narrowband hiss emissions with ELF chorus emissions outside of the plasmasphere are discussed. Chorus emissions are often observed to start at frequencies that are within a hiss band. Spectra show large variations in amplitude between adjacent bins with relative maxima 10 to 15 db above adjacent minima. Electrons in a narrow range of energies and pitch angles are organized in phase by the Doppler shifted cyclotron resonance with the large amplitude spectra components in the hiss band. The bandwidth of the cyclotron resonance is sufficiently narrow so that the electrons are not dephased by waves in adjacent portions of the highly structured spectrum. The amplitude of the hiss is sufficient to significantly phase bunch the electrons in the calculated interaction time. The chorus emission is generated as the phase bunched electrons moves adiabatically along the geomagnetic field line. This mechanisms accounts for the chorus emissions detected at frequencies above a hiss band in the Jovian magnetosphere. E.A.K.

N82-16644# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

THE CONVERSION OF AIRCRAFT ICE CRYSTAL MEASUREMENTS INTO TERMS OF LIQUID WATER USING SIMULATED DATA Interim Report

Robert O. Berthel 16 Jun. 1981 46 p refs

(AF Proj. 6670; AF Proj. 2310)

(AD-A106419; AFGL-TR-81-0173; AFGL-ERP-745) Avail: NTIS HC A03/MF A01 CSCL 04/1

This investigation presents simulated environments of ice crystals to computer analysis as a means of imitating particle measurements made by electro-optical devices such as the Particle Measuring System's 1-D instrument. A mathematical model is developed so that single crystals of known geometric form can be processed by considering each crystal's spatial relationship to the assumed measuring instrument. Crystal orientation is defined using a random number technique. The results of the assumed measurements are converted into mass of equivalent liquid water by different methods and are compared with the known mass of the simulated environment. Relationships are derived for the conversion of several forms of single ice crystals into terms of equivalent melted diameters of liquid water and a comparison is made between the mass calculated from the derived equations with the conversion equations relating measured length to equivalent melted diameter currently in use.
Author (GRA)

N82-16645# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPARISON OF THE DYNAMIC PROCESSES DURING MAJOR AND MINOR STRATOSPHERIC WARMINGS IN A NUMERICAL MODEL M.S. Thesis - Utah Univ.
James Howard Davenport Jun. 1981 109 p refs
(AD-A106371; AFIT-CI-81-29T) Copyright. Avail: Issuing Activity CSCL 04/1

In this study we have analyzed the processes involved in a major and minor warming based on data generated from a 31-layer primitive equation spectral model consisting of a 5-layer troposphere, 12-layer stratosphere and 14-layer mesosphere. The forcing of the model consisted of orographic features designed to simulate the major Northern Hemisphere continents. This gave a combination of wave number 1 and wave number 2 forcing. The analysis of the simulated major and minor warmings indicated several similarities and differences between the cases. The initial difference between the cases is that case 1 (major warming) had a weak polar vortex, while case 2 (minor warming) had a strong polar vortex. This resulted in case 2 having much larger turbulent flux terms, but not sufficient to reverse the mean polar winds. Case 1 produces a major warming in the polar stratosphere. GRA

N82-16646# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
LOW-ENERGY ION PITCH-ANGLE DISTRIBUTION IN THE OUTER MAGNETOSPHERE: ION ZIPPER DISTRIBUTIONS
J. F. Fennell, D. R. Croley, Jr., and S. M. Kaye (Lockheed Missile and Space Co., Palo Alto, Calif.) 28 Sep. 1981 31 p refs
(Contract F04701-80-C-0081)
(AD-A106153; TR-0081(6960-05)-15; SD-TR-81-81) Avail: NTIS HC A03/MF A01 CSCL 04/1

Ion pitch-angle distributions, measured in a near synchronous orbit, are predominantly field-aligned at low energies and predominantly peaked perpendicular to the magnetic field at higher energies. The transition from field-aligned fluxes to fluxes peaked predominantly perpendicular to the magnetic field occurs over a very narrow energy range. These ion distributions have been observed at all local times between 5.3 Re and 7.8 Re. This transition energy correlates between the ion transition energy and magnetic local time, L, Kp, or Dst. Author (GRA)

N82-16647# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
MAGNETIC SHELL TRACING: A SIMPLIFIED APPROACH
Janet G. Luhmann and Michael Schulz 15 Sep. 1981 22 p refs
(Contract F04701-80-C-0081)
(AD-A106714; TR-0081(6960-05)-9; SD-TR-81-78) Avail: NTIS HC A02/MF A01 CSCL 04/1

We consider the adiabatic motion of electrons trapped in the model geomagnetic field derived from a scalar potential. The drift shell is specified analytically (i.e., by an approximation given in closed form) in terms of the equatorial pitch angle. The 'radial gradient' is inferred from the diurnal variation of particle flux. This procedure offers an internal test for the absence of time-varying coefficients in the expansion of V. The pitch-angle distribution is directly observed at the noon meridian. The parameters thus determined allow the pitch-angle distribution at other longitudes to be obtained from Liouville's theorem. The results, at least for a well-studied test case, are comparable in quality to those obtained by more difficult methods, using a more complicated field model and the data from two spacecraft, i.e., are in similarly good agreement with the observational data obtained at other longitudes. In particular, we find that the maximum flux at alpha sub 0 = pi/2 occurs at noon (phi = pi) and that the maximum flux j(alpha sub 0, phi = 0) at midnight (phi = 0) occurs at alpha sub 0 not = pi/2. GRA

N82-16648# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Atmospheric Sciencz.
A CLIMATE INDEX DERIVED FROM SATELLITE MEASURED SPECTRAL INFRARED RADIATION Ph.D. Thesis
Michael David Abel Apr. 1981 160 p refs
(AD-A106733; AFIT-CI-81-46D) Avail: NTIS HC A08/MF A01 CSCL 04/1

This thesis introduces a climate index based on radiative transfer theory and derived from the spectral radiances typically used to retrieve temperature profiles. It is assumed that clouds and climate are closely related and a change in one will result in a change in the other. Because the index developed in this paper is primarily a function of the cloud distribution and also dependent upon temperature and moisture distributions, it may be used as a climate index. The advantage is that the index is more accurately retrieved from satellite data than cloudiness per se. This index, hereafter referred to as the VIRES index (for Vertical Infrared Radiative Emitting Structure), is based upon the shape and relative magnitude of the broadband weighting function of the infrared radiative transfer equation. The broadband weighting curves (VIRES curves) are retrieved from simulated satellite infrared sounder data (spectral radiances). The VIRES index is a useful means of classifying the VIRES curves. This thesis describes the retrieval procedure and investigates error sensitivities of this method. Advantages of the approach include; day and night capability, no need to know cloud radiative properties, retrieval ability when cloud fraction or cloud emittance is less than 1.0, retrieved information below sensor resolution, minimum influence on the index from low tropospheric retrieval errors, and the ability to statistically discriminate between VIRES curves retrieved from different scenes. Operational VIRES index retrieval strategies and a number of specific applications are also proposed. Author (GRA)

N82-16649# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ALTERNATE APPROACH TO THE MEASUREMENT OF SOIL SURFACE HEAT FLUX M.S. Thesis - Arizona Univ.
Bruce Rex Merrill 1981 59 p refs
(AD-A106741; AFIT-CI-81-33T) Avail: NTIS HC A04/MF A01 CSCL 08/13

A new approach to the measurement of the conductive heat flux at the soil surface is presented. This approach provides the means to make measurements of the soil conduction heat flux. By sensing the temperature of the soil surface and using a temperature control circuit one forces an artificially created portion of the soil surface to mimic the temperature of the natural surface. By monitoring the power to maintain this control one makes a direct measurement of the conduction heat flux at the soil surface. Although the present instrument works only when the conduction heat flux is directed out of the ground there is nothing in principle to prevent the instrument from working when the flux is in the other direction. The error analysis shows that the two main sources of error are due to the electronics design and the errors associated with measuring the true temperature of a surface. Laboratory testing shows that unexplained error amounts to only a few percent at most. Laboratory testing also shows that the instrument is capable of measuring fluxes down to tenths of milliwatts per square centimeter. Author (GRA)

N82-16650# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ANALYSIS OF DATA FOR THE DEVELOPMENT OF DENSITY AND COMPOSITION MODELS OF THE UPPER ATMOSPHERE Final Report, 1 Jun. 1978 - 31 May 1981
Luigi G. Jacchia and Jack W. Slowey Hanscom AFB, Mass. Jul. 1981 19 p refs

(Contract F19628-78-C-0126; AF Proj. 6690)
(AD-A106420; AFGL-TR-81-0230) Avail: NTIS HC A02/MF A01 CSCL 04/1

This work was directed toward the ultimate goal of developing an improved model of the temperature, density and composition of that region of the Earth's neutral atmosphere above the turbopause. A wealth of data has become available, mainly in the form of total density and composition from satellite-borne mass-spectrometers, in recent years. Most of the work performed under the contract consisted of the analysis of data from the ESRO 4 mass spectrometer with a view towards improvement of the model of the geomagnetic variation in the thermosphere and exosphere. GRA

N82-16651# California Univ., Livermore. Lawrence Livermore Lab.

AN OVERVIEW, CURRENT STATUS, AND FUTURE PLANS FOR THE DOE ATMOSPHERIC STUDIES IN COMPLEX TERRAIN (ASCOT) PROGRAM

Marvin H. Dickerson Jun. 1981 5 p refs Presented at AMS Second Conf. on Mt. Meteorol., Steamboat Springs, Colo., 10-13 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE91-024417; UCRL-85725; CONF-811104-2) Avail: NTIS HC A02/MF A01

The problem of pollutant transport over complex terrain is investigated. The nocturnal valley drainage flow is chosen as the initial focus of the ASCOT program. The Geyser geothermal area in northern California is the initial study site. Objectives were defined as: (1) to augment the present knowledge of the physical mechanisms involved in the development, perpetuation, and breakup of nocturnal drainage flows; (2) to develop an integrated measurement and modeling methodology to perform as quality impact assessment and control strategies for energy development in areas subject to drainage flows; and (3) to provide the developed methodology with special applications to the H2S emissions associated with the Geysers geothermal development. DOE

N82-16652# Stanford Univ., Calif. Petroleum Research Inst.

EFFECTS OF CONFINING PRESSURE, PORE PRESSURE AND TEMPERATURE ON ABSOLUTE PERMEABILITY

Brian D. Gobran, Henry J. Ramey, Jr., and W. E. Brigham Oct. 1981 115 p refs
(Contract DE-AC03-76ET-12056)
(DE81-030336; DOE/ET-12056/27) Avail: NTIS HC A06/MF A01

The absolute permeability of consolidated sandstone and unconsolidated sand cores to distilled water as a function of the confining pressure on the core, the pore pressure of the flowing fluid, and the temperature of the system was studied. It is found that inaccurate measurement of temperature at ambient conditions and non-equilibrium of temperature in the core can lead to a fictitious permeability reduction with temperature increase. The results of this study on the effect of confining pressure and pore pressure support the theory that as confining pressure is increased or pore pressure decreased, the permeability is reduced. The effects of confining pressure and pore pressure changes on absolute permeability are given explicitly. DOE

N82-16653# Environmental Exploration, Morgantown, W. Va.

HANDBOOK OF GEOPHYSICAL CAVITY-LOCATING TECHNIQUES WITH EMPHASIS ON ELECTRICAL RESISTIVITY

Keith G. Kirk and Eberhard Werner Washington Federal Highway Administration Apr. 1981 187 p refs
(PB81-242711; FHWA/IP-81/3) Avail: NTIS HC A09/MF A01 CSCL 13B

A method in locating cavities in the Earth resistivity technique is examined. The methodology of using Earth resistivity techniques for locating cavities is described. The theoretical considerations behind these techniques are mentioned. GRA

N82-16108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A VLBI SURVEY OF THE NORTHERN POLAR CAP REGION

D. D. Morabito, R. A. Preston, and J. Faulkner *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 30-36 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 08E

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-16654# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SYNOPTIC SCENARIO OF THE INVASION OF COLD AIR DURING THE FREEZE OF MAY 1979 AND FROST MAPPING TO FORECAST AREAS OF MAJOR RISK

Michael Fortune Jul. 1981 4 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazilian Agrometeorology Congr., Pelotas, 5-10 Jul. 1981
(INPE-2166-RPE/383) Avail: NTIS HC A02/MF A01

Satellite images obtained at INPE were analyzed with synoptic data from drifting buoys, radiosondings, and satellite winds and soundings when a strong invasion of polar air led to damaging frosts in Brazil. The analysis showed: a long wave in the west central Pacific began to amplify unusually three days before frontogenesis and five days before the severest frosts in Brazil, with the superposition of a short wave on the deepening long wave trough in Argentina, frontogenesis occurred. The next day this front surged rapidly into Brazil, and was accompanied by four or more squall lines. The front reached within 1 deg. of the equator, and the extraordinarily deep trough channelled subantarctic air into Brazil under clear skies, this led to severe frost in five southern states. S.L.

N82-16655*# MCS, Inc., Boulder, Colo.

NUMERICAL AND FLIGHT SIMULATOR TEST OF THE FLIGHT DETERIORATION CONCEPT Interim Report

John McCarthy and Vern Norviel Washington NASA Jan. 1982 37 p refs
(Contract NAS8-33458)
(NASA-CR-3500; M-370) Avail: NTIS HC A03/MF A01 CSCL 04B

Manned flight simulator response to theoretical wind shear profiles was studied in an effort to calibrate fixed-stick and pilot-in-the-loop numerical models of jet transport aircraft on approach to landing. Results of the study indicate that both fixed-stick and pilot-in-the-loop models overpredict the deleterious effects of aircraft approaches when compared to pilot performance in the manned simulator. Although the pilot-in-the-loop model does a better job than does the fixed-stick model, the study suggests that the pilot-in-the-loop model is suitable for use in meteorological predictions of adverse low-level wind shear along approach and departure courses to identify situations in which pilots may find difficulty. The model should not be used to predict the success or failure of a specific aircraft. It is suggested that the pilot model be used as part of a ground-based Doppler radar low-level wind shear detection and warning system. T.M.

N82-16656# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPRESSION OF METEOROLOGICAL SATELLITE IMAGES [COMPRESSAO EM IMAGENS DE SATELITES METEOROLOGICOS]

Valter Rodrigues and Aydano B. Carleial Jul. 1981 15 p refs In PORTUGUESE; ENGLISH summary
(INPE-2182-RPE/393) Avail: NTIS HC A02/MF A01

Some techniques for compression of high resolution meteorological satellite images are analyzed. These techniques are of two kinds: linear operations, and linear and adaptive delta codification. The effects of transmission errors are analyzed in some algorithms. Simulations are presented in one form of meteorological photographs. Author

N82-16657*# Desert Research Inst., Reno, Nev.

STUDY TO PERFORM PRELIMINARY EXPERIMENTS TO EVALUATE PARTICLE GENERATION AND CHARACTERIZATION TECHNIQUES FOR ZERO-GRAVITY CLOUD PHYSICS

EXPERIMENTS Final Report
Ulrich Katz Washington NASA Jan. 1982 195 p refs (Contract NAS8-32313)
(NASA-CR-3486; M-368) Avail: NTIS HC A09/MF A01 CSCL 04B

Methods of particle generation and characterization with regard to their applicability for experiments requiring cloud condensation nuclei (CCN) of specified properties were investigated. Since aerosol characterization is a prerequisite to assessing performance of particle generation equipment, techniques for characterizing aerosol were evaluated. Aerosol generation is discussed, and atomizer and photolytic generators including preparation of hydrosols (used with atomizers) and the evaluation of a flight version of an atomizer are studied. E.A.K.

N82-16658*# Wisconsin Univ. - Madison. Dept. of Meteorology.
EFFECTS OF DIABATIC HEATING ON THE AGEOSTROPHIC CIRCULATION OF AN UPPER TROPOSPHERIC JET STREAK Interim Report
Dennis Arthur Keyser and Donald R. Johnson Jan. 1982 135 p refs
(Contract NAS8-33222)
(NASA-CR-3497; M-369) Avail: NTIS HC A07/MF A01 CSCL 04B

Interaction between the mass circulation within a mesoscale convective complex (MCC) and a direct mass circulation in the entrance region of an upper tropospheric polar jet streak was examined within the isentropic structure to investigate mechanisms responsible for linking these two scales of motion. The results establish that latent heating in the MCC modifies the direct mass circulation in the jet streak entrance region through the diabatically induced components of ageostrophic motion analyzed within isentropic coordinates. Within the strong mesoscale mass circulation of each MCC, strong horizontal mass flux convergence into the MCC at low levels is balanced by strong horizontal mass flux divergence away from the convergence at upper levels. Locations of large diabatic heating rates correspond well to the MCC position for each case; diabatic heating forces the upward vertical branch for the mesoscale mass circulation. T.M.

N82-16659*# FWG Associates, Inc., Tullahoma, Tenn.
DESIGN OF PROTOTYPE CHARGED PARTICLE FOG DISPERSAL UNIT Final Report
Frank G. Collins, Walter Frost, and Philip Kessel Washington, D.C. NASA Dec. 1981 41 p refs
(Contract NAS3-33541)
(NASA-CR-3481; M364) Avail: NTIS HC A03/MF A01 CSCL 04B

The unit was designed to be easily modified so that certain features that influence the output current and particle size distribution could be examined. An experimental program was designed to measure the performance of the unit. The program described includes measurements in a fog chamber and in the field. Features of the nozzle and estimated nozzle characteristics are presented. T.M.

N82-16660*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA/MSFC FY-81 ATMOSPHERIC PROCESSES RESEARCH REVIEW
Robert E. Turner, comp. Dec. 1981 161 p refs Review held in Huntsville, Ala., 1-3 Sep. 1981
(NASA-CP-2204; M-367) Avail: NTIS HC A08/MF A01 CSCL 04B

Progress in ongoing research programs and future plans for satellite investigations into global weather, upper atmospheric phenomena, and severe storms and local weather are summarized. Principle investigators and publications since June 1980 are listed. For individual titles, see N82-16661 through N82-16663.

N82-16661*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
UPPER ATMOSPHERIC SECTION
In its NASA/MSFC FY-81 Atmospheric Processes Res. Rev. Dec. 1981 p 1-7 refs (For primary document see N82-16660 07-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Research, technology and monitoring of the upper atmosphere are summarized. Temperature response and polyatomic molecule decomposition in the stratosphere during a geomagnetic storm and the fabrication and verification of software for the atmospheric emissions photometric imager on Spacelab are described. J.D.H.

N82-16662*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GLOBAL WEATHER RESEARCH
In its NASA/MSFC FY-81 Atmospheric Processes Res. Rev. Dec. 1981 p 9-50 refs (For primary document see N82-16660 07-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Modeling, prediction, and analysis of global meteorological phenomena influencing the large scale behavior of the atmosphere are summarized. Prediction of global weather phenomena based on satellite data is discussed and models of global phenomena developed. The atmospheric general circulation model (AGCE) is reviewed, axisymmetric flow calculated, and axisymmetric states in cylindrical, spherical, three dimensional, and spin up numerical models for AGCE described. The role of latent heat release in baroclinic waves, latent heat and cyclonic systems, and a theoretical study of baroclinic flow related to the AGCE and the flow regime were studied with a simplified general circulation model. AGCE and the geophysical fluid flow cell (GFFC) instrumentation are discussed. Investigation of solar and planetary convection for GFFC is described. The utilization of satellite cloud observations to diagnose the energy state and transformations in extratropical cyclones is reviewed. J.D.H.

N82-16663*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SEVERE STORMS AND LOCAL WEATHER RESEARCH
In its NASA/MSFC FY-81 Atmospheric Processes Res. Rev. Dec. 1981 p 51-140 refs (For primary document see N82-16660 07-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Developments in the use of space related techniques to understand storms and local weather are summarized. The observation of lightning, storm development, cloud development, mesoscale phenomena, and ageostrophic circulation are discussed. Data acquisition, analysis, and the development of improved sensor and computer systems capability are described. Signal processing and analysis and application of Doppler lidar data are discussed. Progress in numerous experiments is summarized. J.D.H.

N82-16664# Materials Research Labs., Ascot Vale (Australia).
CLIMATIC CONDITIONS AT AIR FORCE BASES IN AUSTRALIA
Barry T. Murrell and John A. McRae Oct. 1980 124 p refs (AD-A106275; MRL-R-787) Copyright. Avail: Issuing Activity CSCL 04/2

The climatic conditions at ground level expected to be encountered at Air Force bases in the Australian Region are tabulated. Mean conditions for each season and the extremes for return periods up to 1000 years are given for temperature, humidity, wind speed and rainfall of various durations as well as information about solar radiation and a number of meteorological conditions including hail, snow, frost, fog, thunder, dust and haze. Author (GRA)

N82-16665# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
DEVELOPMENT OF A LARGE SCALE CLOUD SYSTEM, 23-27 MARCH 1978
Ian D. Cohen 4 May 1981 111 p refs
(AF Proj. 2310)
(AD-A106417; AFGL-TR-81-0127; AFGL-ERP-739) Avail: NTIS HC A06/MF A01 CSCL 04/2

The visual and microphysical properties of a large scale cloud system are described as that system developed from an open wave in Oklahoma to a deep occlusion covering most of the east coast of the United States. Microphysical properties examined include particle size, liquid water content, particle density, crystal type, and Form Factor (a measure of uniformity of particle sizes within a sample). Visual and microphysical observations were made at four levels, approximately at the 400, 400, 700, and 850-mb surfaces, on four consecutive days. On each day the

MC-130E aircraft instrumented for cloud physics research by AFGL flew at each level for approximately 30 minutes. In addition to examination of the continuous data provided by the aircraft, a detailed examination of 32 samples of 2 min each was undertaken. Sampling was conducted in the northeast quadrant of the storm. During the first day, the storm was mainly convective in nature, and as a result, had high liquid water content and particle distributions which were uniform along the vertical axis. As the storm moved eastward, it became more stratified. As it did, the observed particle size and types showed greater variations. The upper levels were affected less than the lower levels, thus reducing the uniformity along the vertical axis. As the system occluded, it lost moisture, producing smaller hydrometeors, lower liquid water content, and lighter precipitation at the surface. Later, an influx of water air increased the liquid water content and the intensity of the precipitation. GRA

N82-16666# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.

WINTER AND SUMMER MEASUREMENTS OF EUROPEAN VERY LOW ALTITUDE VOLUME SCATTERING COEFFICIENTS Interim Scientific Report

Richard W. Johnson Jun. 1981 26 p refs
(Contract F19628-78-C-0200; AF Proj. 7670)
(AD-A106363; SIO-REF-81-26; AFGL-TR-81-0154; ISR-5)
Avail: NTIS HC A03/MF A01 CSCL 04/2

This report presents measurements of atmospheric volume scattering coefficients collected during twenty-nine low altitude flights made during the winter and summer seasons of 1978 at four different European locations. The measurements were conducted during an instrumented aircraft's final approach and landing at its staging airbase. The measurements were made using a pseudo-photopic spectral response and thus are suitable for comparison with data associated with standard visual determinations of airfield visibility. The data illustrate that in twenty-six of twenty-nine cases, there was little or no significant variation in the value of scattering coefficient as the aircraft approached the surface from an altitude of several hundred meters. Author (GRA)

N82-16667# Texas A&M Univ., College Station. Dept. of Meteorology.

PRECIPITATION FIELD AND INTRASTORM FLOW OF SUPERCELL CONVECTIVE STORMS Final Report

Daniel James McMorrow Aug. 1981 280 p refs
(Grant AF-AFOSR-0063-80; AF Proj. 2310)
(AD-A106752; AFOSR-81-0699TR) Avail: NTIS
HC A13/MF A01 CSCL 04/2

Single-Doppler radar data, when supplemented by surface and upper-air information, provides good estimates of the intrastorm kinematic structure of supercell storms. Spatially derived fields of radial velocity, defined as radial stretching and cross-beam shear, can be used to identify and track major intrastorm kinematic features. These fields can be computed quickly and required neither storm motion information nor a favorable beam-flow alignment. Comparisons between multi-Doppler analyses (and numerical simulation) and the single-Doppler fields show good correlations of the updraft and downdraft zones as well as storm inflow and outflow areas. Changes in surface precipitation rates, from isolated and squall line supercells, are reflected in changes in the intrastorm flow inferred from single-Doppler data. This offers a new technique for single-Doppler radar analyses. In addition, a detailed study of the changes in supercell surface rainfall rates, over a high-resolution raingage network, suggests that a simple linear relationship exists between the maximum point rainfall rate and the areal coverage of threshold rates of 25 mm hr-1 and 55 mm hr-1. Point-area statistical models are presented for individual rain cores, the storm rainfall, and for rainfall over a 4000 km2 watershed. This investigation is the first known detailed study of single-Doppler data and surface rainfall observed over a short time interval. Temporal changes in supercell kinematic structure are related to changes in surface rainfall rates. Supercell rainfall in several different environments are presented. The results suggest that changes in surface rainfall rates are related to changes in intrastorm kinematic flow. Author (GRA)

N82-16668# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SYNOPTIC CLIMATOLOGY OF BELL-SHAPED THUNDERSTORMS M.S. Thesis - Oklahoma Univ.

Carlton R. Parks 1981 96 p refs
(AD-A106158; AFIT-CI-81-27T) Avail: NTIS
HC A05/MF A01 CSCL 04/2

Eleven cases of bell-shaped thunderstorm occurrence are analyzed for characteristic features of synoptic patterns, vertical wind shear, and temperature and moisture stratification. Comparisons are made with certain well-documented supercell and multi-cell cases. A model synoptic pattern, sounding, and hodograph are presented. Major findings are: the storms formed in a highly unstable environment just ahead of a dryline, often near a dryline/front intersection. A strong upper-level disturbance was not required to trigger the storms. The storms formed as isolated cells, often to the south of a broker line of existing storms, and often continued as isolated cells for several hours. Except for being slightly more unstable, the environment of the storms did not differ significantly from that of the supercells, but did differ significantly from that of the multi-cell storms. An intense updraft, and the absence of a water-loaded downdraft, may be responsible for many of the physical characteristics of the storms. Author (GRA)

N82-16669# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Atmospheric Science.

TROPICAL CYCLONE INTENSITY CHANGE: A QUANTITATIVE FORECASTING SCHEME M.S. Thesis - Colorado State Univ.

Kenneth M. Dropco 2 Apr. 1981 95 p refs
(Grant NOAA-NA79-RAD-00002)
(AD-A106157; AFIT-CI-81-30T) Avail: NTIS
HC A05/MF A01 CSCL 04/2

Tropical cyclone intensity change is investigated by comparing tropical cyclone systems which intensify to those which do not. The basis of the intensity change problem was to investigate the effects of baroclinic interaction on the poleward side of cyclone systems. Therefore, cyclones found in the Gulf of Mexico during the period 1957-1977 were examined primarily because of the abundance of data on the north side of these systems. When common meteorological differences could not be found by examination of the weather charts, a rawinsonde composite analysis was performed to investigate mean differences between the two systems. The results obtained were significant. Very large differences were found on the northern side of the cyclone particularly in the 200 mb height field, the 850 mb temperature field, the 200 mb zonal wind and the vertical shears of the zonal wind. The individual cyclones which made up the composite study were examined for these same parameters and the results obtained were also significant. GRA

N82-16670# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Atmospheric Sciences.

AN OBSERVATIONAL STUDY OF BLOCKING M.S. Thesis

Michael Lindley DSpain 8 Jun. 1981 133 p refs
(AD-A106739; AFIT-CI-81-28T) Avail: NTIS
HC A07/MF A01 CSCL 04/2

The initial purpose of this paper was to use the original concept developed by Hartmann and Ghan (1979) of separating the anomalous ridges solely on the basis of duration and proceed to formulate 3-dimensional pictures from the 1000, 850, 500, and 100 mb pressure levels of the long and short lived ridges, observing any differences which might exist. The three areas of ridge formation studied were defined as the Pacific Ocean (175E-155W), the Pacific Coast (140W-115W), and the Atlantic Ocean (65W-25E). The Pacific regions were characterized by a well developed upstream trough, the ridge itself, and the downstream wavetrains. Both Pacific cases appear consistent with the idea of enhanced production of wave energy due to heating over either the mid-latitude or tropical ocean as suggested by Hoskins and Karoly (1981). The Atlantic cases did not exhibit the same downstream influences as the Pacific cases. The similarity in the height fields over North America between the short and long-lived ridges and the differences in the thermal fields suggests a relationship between the cold temperatures over North America and the long-lived ridges over the Atlantic. Author (GRA)

N82-16671# Control Data Corp., Minneapolis, Minn.
A CLIMATOLOGY OF A NEWLY DEFINED TROPOPAUSE USING SIMULTANEOUS OZONE TEMPERATURE PROFILES
Final Report, 1 Jul. 1979 - 1 Jul. 1981
J. M. Roe Hanscom AFB, Mass. AFGL May 1981 109 p refs
(Contract F19628-79-C-0098; AF Proj. 6687)
(AD-A106399; AFGL-TR-81-0190) Avail: NTIS HC A06/MF A01 CSCL 04/2

A physical distinction between stratosphere and troposphere can be made in terms of potential vorticity or ozone. The World Meteorological Organization (WMO) tropopause, based only on thermal stability, does not always separate the different physical properties of the two regions. It is the purpose of this paper to show that the altitude in a vertical ozone profile at which ozone, and therefore potential vorticity, begins to increase rapidly is determinable from the temperature profile alone. The tropopause definition developed here reduces the WMO temperature gradient and thickness criteria and relies on the relative change of temperature lapse rate. The new definition determines heights of the tropopause that are in excellent agreement with ozone profile information. The proposed tropopause definition was applied to an archived ten year global radiosonde data set to prepare a climatology. The definition was also applied to an archived set of several thousand ozonesonde temperature profiles to prepare a climatology of vertical ozone gradient at the tropopause.
Author (GRA)

N82-16672# California Univ., Livermore. Lawrence Livermore Lab.
IMPLICATION OF SPATIAL AVERAGING IN COMPLEX TERRAIN WIND STUDIES
William Porch 19 Jun. 1981 8 p refs Presented at the AMS Conf. on Mt. Meteorol., Steamboat Springs, Colo., Nov. 1981
(Contract W-7405-eng-48)
(DE81-024451; UCRL-85525-Rev-1; CONF-811104-1) Avail: NTIS HC A02/MF A01

Studies of wind over complex terrain were conducted at two different times at the Geyser's geothermal region of northern California. Optical anemometers with spatial averaging over path lengths of 0.6 to .1 km and conventional cup vane anemometers were utilized. Measurements of spatially averaged wind were used to obtain the average drainaged wind speed component down a small sloping valley with few locations with reasonable instrument exposure accessible to cup anemometers. By comparing the point and spatially averaged wind measurements, it was hoped that data periods could be chosen for numerical wind field model testing when the two measurements were similar. DOE

N82-16673# Pacific Northwest Lab., Richland, Wash.
THE WIND CHARACTERISTICS PROGRAM ELEMENT
Annual Report, Oct. 1979 - Sep. 1980
L. L. Wendell, W. R. Barchet, J. R. Connell, A. H. Miller, W. T. Pennell, and D. S. Renne Sep. 1981 200 p refs
(Contract DE-AC06-76RL-01830)
(DE82-004876; PNL-3876) Avail: NTIS HC A09/MF A01

The progress accomplished directly by the Pacific Northwest Laboratory (PNL) and by subcontractors funded directly by DOE or through PNL is reported. To expedite the management of the activities to produce the required information, the WCPE was divided into three program areas: wind energy prospecting, support for design and operations, and site evaluation. Accomplishments in each of these program areas provide a highlight of WCPE activities. DOE

N82-16674# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
GUIDE TO BIOLOGICAL WIND PROSPECTING
J. E. Wade and E. W. Hewson Oct. 1981 123 p refs
(Contract DE-AT06-76ET-20316)
(DE82-001425; DOE/ET-20316/80-2) Avail: NTIS HC A06/MF A01

Biological wind prospecting provides techniques for using the natural indicators around us as a guide to the strength, speed, frequency, and direction of the wind. The basis for this wind prospecting is interpretation and study of the shape and distribution of trees, shrubs, insects, and animals, combined with analysis of the impressions of people living in the areas under investigation. The quantitative relationship between mean annual wind speed and three indices of wind effects on trees is shown. Trees can be used successfully to determine mean wind direction, identify the occurrence of severe wind or ice loads, and, most importantly, to estimate mean annual wind speed. DOE

N82-16675# Miami Univ., Fla. School of Marine and Atmospheric Science.
ON THE ANALYSIS OF SEASAT WINDS
Mariano A. Estoque and Jose J. Fernandez-Partagas Apr. 1981 24 p refs
(Grant NA-79-SAC-00737)
(PB81-245649; UM-RSMAS-81001; NOAA-81071407) Avail: NTIS HC A02/MF A01 CSCL 04B

A method for analyzing Seasat-A winds in tropical regions is described which eliminates the ambiguity in the Seasat wind measurement. The ambiguity is eliminated by using wind estimates from low-level cloud motions and synoptic cloud patterns based on satellite pictures, surface wind climatology as well as space-time continuity. In addition, the method takes advantage of certain characteristics of the Seasat wind observations such as the existance of (1) only two solutions at a single point and (2) small angles between solutions. The accuracy of the method has been evaluated by comparing the results of the analysis technique with indepndent observations from ships. GRA

N82-16676# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Weather Research and Modification.
ICE CRYSTAL PROCESSES IN COLORADO, UPSLOPE SNOWSTORMS. ARTICLE 1: CASE STUDY OF AN UPSLOPE SNOWSTORM
H. Riehl and R. F. Reinking Apr. 1981 39 p refs
(PB82-109547; NOAA-81080502) Avail: NTIS HC A03/MF A01 CSCL 04B

The structure and cloud physics characteristics of the lower atmosphere were measured during upslope circulations. Low level air moving westward and upward over the high plains toward the Colorado front range was presumed to induce snowfall or ice deposit on the ground. A cyclonic event occurred in the last week of December, and aircraft missions were flown on 27 December when the storm was at its height east of the mountains. The synoptic system was an upper level cold low advancing at an average speed from southwest into southern Colorado. On the forward side, mesoscale waves appeared to form along the cold front, one of these was crossed by the aircraft. Maximum concentrations of liquid water, turbulence, and shift in thermal advective pattern was found there. GRA

N82-16677# National Weather Service, Fort Worth, Tex. Scientific Services Div.
WEATHER SATELLITE INTERPRETATION: INTRODUCTION TO WEATHER SATELLITE IMAGERY
David L. Carlson Jun. 1981 54 p refs
(PB82-107657; NOAA-TM-NWS-SR-103; NOAA-81081105) Avail: NTIS HC A04/MF A01 CSCL 04B

This manual was designed to be a basic self-study course for the new GOES (Geostationary Operational Environmental Satellite). They may also be referred to as SMS, Synchronous Meteorological Satellite. Five GOES satellites launched by the U.S. and two others launched by Europe and Japan provide global coverage plus backup capability. Content of the manual includes basic operation of the GOES system and detailed explanations of some of the most commonly used GOES photos. The test consists of two chapters, a criterion test at the end of each chapter, and a comprehensive photo interpretation examination. GRA

N82-16678# Environmental Research and Technology, Inc., Concord, Mass.
SATELLITE CLOUD ANALYSIS OVER THE GATE AREA ON 4 AUGUST 1974
James H. Willand May 1981 21 p refs
(Grant NOAA-NA81-AA-A-01207)
(PB82-107582; ERT-P-A845; NOAA-81081109) Avail: NTIS HC A02/MF A01 CSCL 04B

Capabilities in deriving cloud statistics, Satellite Cloud Data

Sets were assessed. An objective cloud analysis technique using satellite infrared and visible data is discussed. The method used for obtaining cloud statistics, some results obtained and problems concerning the extraction of global cloud statistics from satellites are presented. GRA

N82-16679# Chicago Univ., Ill. Satellite and Mesometeorology Research Project.
MESOSCALE ASPECTS OF CONVECTIVE STORMS
T. Theodore Fujita Aug. 1981 12 p refs Presented at Nowcasting Symp., Hamburg, 12-28 Aug. 1981 Submitted for publication
(Grants NA80AA-D-00001; NGR-14-001-008; NSF ATM-79-21260)
(PB81-247249; SMRP-RP-191; NOAA-81071408) Avail: NTIS HC A02/MF A01 CSCL 04B

Mesoscale phenomena is studied as it relates to severe local and rain storms. It is concluded that a very accurate combination of radar and satellite measurements hold the key to forecasting the nature of mesoscale clouds, the inducers of severe local storms. Extensive use is made of cloud photographs in analyzing mesoscale phenomena. Examples of severe storm wakes are examined, as are flash flood causing clouds. GRA

N82-16680# Intermountain Forest and Range Experiment Station, Ogden, Utah.
WHY WINDSPEEDS INCREASE ON HIGH MOUNTAIN SLOPES AT NIGHT
Robert G. Baughman Jul. 1981 12 p refs
(PB81-243909; FSRP-INT-276) Avail: NTIS HC A02/MF A01 CSCL 02F

The contention that the well documented windspeed increase on high mountain slopes at night is due to the occurrence of a low level jet wind. Various aspects of the meteorological situation most likely to produce these winds are discussed. An example of a low level jet wind that produced strong winds on a ridgetop fire at night is given. T.M.

N82-16681# National Hurricane Center, Coral Gables, Fla.
ANNUAL DATA AND VERIFICATION TABULATION ATLANTIC TROPICAL CYCLONES, 1980
Glenn Taylor Jun. 1981 84 p refs
(PB81-246050; NOAA-TM-NWS-NHC-15; NOAA-81070904; Rept-7) Avail: NTIS HC A05/MF A01 CSCL 04B

A summary of cyclone statistics is given. Tracks of named storms are shown. T.M.

N82-16682# National Weather Service, Silver Spring, Md. National Hurricane Center.
FREQUENCY AND MOTION OF ATLANTIC TROPICAL CYCLONES
C. J. Neumann and M. J. Pryslak Mar. 1981 71 p refs
(PB81-247256; NOAA-TR-NWS-26; NOAA-81070901) Avail: NTIS HC A04/MF A01 CSCL 04B

A statistical analysis of 663 tropical storms recorded over the Atlantic area over the period 1899 to 1978 are presented. Numerous charts are included indicate the average storm frequency per unit area per 100 year interval, mean result speed and direction, and the storm tracks upon which the above data was based. Tables also present the means and standard deviations of storm translation speed. GRA

N82-17058*# Auburn Univ., Ala. Dept. of Mathematics.
A STUDY OF THE GEOGRAPHIC COVERAGE PROPERTIES OF A SATELLITE BORNE DOPPLER LIDAR WIND VELOCITY MEASURING SYSTEM
Thomas H. Pate *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 26 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

N82-17065*# Newberry Coll., S.C. Dept. of Mathematics and Physics.
THUNDERSTORM ELECTRIC FIELD MODELLING
Arjun Tan *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 10 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

N82-17072*# Alabama Univ. in Huntsville. Dept. of Mathematics.
STATISTICAL ANALYSIS OF DAILY MEAN TEMPERATURES
Deva C. Ross *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1980 13 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-16683*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
NOSS ALTIMETER ALGORITHM SPECIFICATIONS
D. W. Hancock, R. G. Forsythe, and J. D. McMillan (Washington Analytical Services Center, Pocomoke City, Md.) Jan. 1982 112 p refs
(NASA-RP-1083) Avail: NTIS HC A06/MF A01 CSCL 08C

A description of all algorithms required for altimeter processing is given. Each description includes title, description, inputs/outputs, general algebraic sequences and data volume. All required input/output data files are described and the computer resources required for the entire altimeter processing system were estimated. The majority of the data processing requirements for any radar altimeter of the Seasat-1 type are scoped. Additions and deletions could be made for the specific altimeter products required by other projects. T.M.

N82-16684# Electronics Research Lab., Adelaide (Australia).
WATER TURBIDITY MEASUREMENTS IN GULF SAINT VINCENT
D. M. Phillips, M. L. Scholz, and R. H. Abbot Feb. 1981 28 p refs
(AD-A106274; ERL-0186-TR) Copyright. Avail: Issuing Activity CSCL 08/1

Large scale surveys have been made of the horizontal and vertical distributions of turbidity in the waters of Gulf St. Vincent in South Australia. The beam attenuation coefficient at a wavelength of 530 nm was determined from measurements made with a transmissometer operated from a boat. Both horizontal and vertical stratification of turbidity was observed and explanations for these two conditions are offered. Two methods for determining water turbidity from an aircraft were investigated. They involved measuring the amplitude and attenuation of the backscatter envelope from a laser pulse transmitted from the aircraft into the water. The relative merits of the two methods are evaluated. Author (GRA)

N82-16685# Washington Univ., St. Louis, Mo. Center for the Space Sciences.
QUANTITATIVE DATA ON THE ABUNDANCES AND DISTRIBUTION OF SEAMOUNTS IN THE PACIFIC OCEAN Report, 1980 - 1981
Rodey Batiza 1981 27 p
(Contract N00014-80-C-0856)
(AD-A107853; MCP-498) Avail: NTIS HC A03/MF A01 CSCL 08/10

The purpose of this report is to outline the methods used in the course of work on 'Statistical Studies of Oceanic Volcanoes.' It includes a description of the procedures used in the study, a description of the data base of Pacific Ocean seamounts which was compiled as part of the study, and descriptions of FORTRAN programs which were written to facilitate data analysis. In addition, this report contains examples of data tables and graphs of raw data to show their format and contents. This report is intended to facilitate use of the seamount data base by others and to provide the materials necessary for implementing use of the data base for purposes other than those of the present study. Complete listings of the data and plots are available from the author. Author (GRA)

N82-16686# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.

CURRENT MEASUREMENTS OFF KEAHOLE POINT, HAWAII: APPLICATION TO OTEC-1
Volker W. Harms Jun. 1981 11 p refs Presented at the DOE/The Marine Technol. Soc. 8th Ocean Energy Conf., 1981, Washington, D.C., 7-11 Jun. 1981
(Contract W-7405-eng-48)
(DE81-030539; LBL-13208; CONF-810622-9) Avail: NTIS HC A02/MF A01

Detailed current measurements from the OTEC 1 vessel permits a preliminary analysis to be made of current induced hydrodynamic loads on the cold water pipe and hydrodynamic mixing along the trajectory of the mixed sea water plume. The measured equilibrium depth of the plume agrees well with that predicted by the plume model and occurs near the base of the ocean mixed layer. Ocean turbulence is found to provide some mixing. Several possible causes for excessive hydrodynamic loading on the cold water pipe are enumerated. DOE

N82-16687# Minnesota Univ. - Duluth.
SEA GRANT PROGRAM, UNIVERSITY OF MINNESOTA Annual Report, 1979
1980 20 p refs
(PB81-243958; NOAA-81063005) Avail: NTIS HC A02/MF A01 CSCL 08J

Minnesota's second year as a comprehensive Sea Grant effort was marked by some major accomplishments. Particularly noteworthy was the expansion of the research program. During 1978-1979 the total research effort was doubled and water safety added as an important new sub-program component. In addition, the Sea Grant Extension Program added a recreational and commercial fisheries agent to develop educational programs for the state's important fishery resource. GRA

N82-16688# National Ocean Survey, Rockville, Md. Circulatory Surveys Branch.
COOK INLET CIRCULATORY SURVEY: 1973-75
Richard C. Patchen, James T. Bruce, and Michael J. Connolly Jun. 1981 97 p refs
(PB81-245235; NOAA-NOS-OCS-4; NOAA-81070902) Avail: NTIS HC A05/MF A01 CSCL 08C

The 3-year circulatory survey conducted by the National Ocean Survey in Cook Inlet, AL is reported. Station location maps and station information tables for the physical parameters are provided. Results of the harmonic analysis performed on the current meter records are included. GRA

N82-16689# Delft Hydraulics Lab. (Netherlands).
NEAR-BOTTOM VELOCITIES IN WAVES WITH A CURRENT
W. T. Bakker Dec. 1980 28 p refs
(PB81-238685; Pub-208; ISSN-0166-7251) Avail: NTIS HC A03/MF A01 CSCL 08C

A mathematical model concerning the sand concentration and velocity distribution in an oscillatory turbulent flow, with or without resultant current, is developed. The flow is assumed to be uniform in horizontal direction. The numerical accuracy of the model was investigated and diagrams are presented which enable the computation by hand of global velocity profiles. GRA

N82-16690# New England Coastal Engineers, Bangor (Maine).
PROCEEDINGS OF THE GULF CIRCULATION STUDIES WORKSHOP Final Report
May 1981 96 p Workshop Held at New Orleans, 14-15 May 1981 Prepared in cooperation with Tetra Tech., Inc., Melville, N.Y.
(Contract DI-AA851-CTO-72)
(PB81-248254; BLM-YM-P/T-81-005-3331) Avail: NTIS HC A05/MF A01 CSCL 08C

On-going and prospective energy-related uses support continued research on the physical processes governing Gulf of Mexico circulation. A circulation modeling effort for the southwest Florida shelf, and a circulation model of the entire Gulf system are described. A three-year research program to obtain physical oceanographic data in the Gulf is discussed. Because the Gulf loop current is the dominating circulation feature, a primary goal of this measurement program is to improve our understanding of the driving forces of the loop current, and the loop current's interaction with general Gulf-wide circulation. T.M.

N82-16691# Texas A&M Univ., College Station. Dept. of Oceanography.
NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY, EXECUTIVE SUMMARY Summary Report
Mar. 1981 140 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81-248643; TR-81-2-T) Avail: NTIS HC A07/MF A01; also available in set of 6 reports HC E99 as PB81-248635 CSCL 08J

This study characterizes selected topographic features in the Gulf of Mexico. Mapping, subbottom profiling, and descriptive reconnaissance studies were completed for the Florida Middle Ground and Alderdice, Coffee Lump, Diaphus, Elvers, Fishnet, Geyer, Jakkula, and Rezak-Sidney Banks. These studies assess the geology and biology of the banks as observed from the submersible DRV DIAPHUS. The report also provides information on four previously studied. Applebaum (previously called Little Sister), 32 Fathom, and the East and West Flower Garden Banks. The East Flower Garden monitoring study was continued, an identical monitoring program was instituted at the West Flower Garden, and maps of the West Flower Garden were prepared. Chemical analysis of sediments for trace metals, high molecular weight hydrocarbons, Delta C-13, and total organic carbon was conducted for Coffee Lump and the East and West Flower Garden Banks. Other studies at the Flower Garden Banks include analysis of 'Spondylus' and certain fish species for trace metals and high molecular weight hydrocarbons, and analysis of water samples for nutrients and dissolved oxygen. GRA

N82-16692# Texas A&M Univ., College Station. Dept. of Oceanography.
NOTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY. VOLUME 1: MANAGEMENT GEOLOGY, BIOLOGY, WATER AND SEDIMENT DYNAMICS. SUMMARY AND BIBLIOGRAPHY Final Report
Mar. 1981 135 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81-248650; TR-81-2-T-Vol-1; BLM-YM-P/T-81-007-3331-Vol-1) Avail: NTIS HC A07/MF A01; also available in set of 6 reports HC E99 as PB81-248635 CSCL 08J

Data from selected areas and topographic features in the Gulf of Mexico and then reduced, mapped, analyzed, synthesized and integrated. The findings and conclusions are reported. Geological, chemical, physical, geophysical, and biological oceanographic data were collected from the Florida Middle Ground (off the west Florida coast) and from twelve topographic features off the Louisiana-Texas coast. GRA

N82-16693# Texas A&M Univ., College Station. Dept. of Oceanography.
NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY. VOLUME 2: METHODS, FOSSIL COCCOLITHS, CHEMICAL ANALYSES Final Report
Mar. 1981 162 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81-248668; TR-81-2-T; BLM-TM-T/T-81-008-3331) Avail: NTIS HC A08/MF A01; also available in set of 6 reports HC E99 as PB81-2486-35 CSCL 08J

Methods and procedures for analyses and sample collection are presented. The distribution of reworked fossil coccoliths on the South Texas Outer Continental Shelf is discussed. GRA

N82-16694# Texas A&M Univ., College Station. Dept. of Oceanography.
NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY, VOLUME 3 Final Report
Mar. 1981 179 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81 248676; TR-81-2-T-Vol-3; BLM-YM-P/T-81-009-3331-Vol-3) Avail: NTIS HC A09/MF A01; also available in set of 6 reports HC E99 as PB81-248635 CSCL 08J

Environmental monitoring of reef communities is presented. The study includes intensive sampling and a variety of in-water sampling and observational activities both by SCUBA and from the DRV DIAPHUS submersible. GRA

N82-16695# Texas A&M Univ., College Station.
NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY. VOLUME 4: OTHER BANKS Final Report
Mar. 1981 182 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81-248684; TR-81-2-T-Vol-4; BLM-YM-P/T-81-010-3331-Vol-4) Avail: NTIS HC A09/MF A01; also available in set of 6 reports HC E99 as PB81-248635 CSCL 08J

In addition to geological and biological reconnaissance and sampling from the submersible studies at Coffee Lump Bank includes mapping and subbottom profiling, hydrographic sampling, and chemical analysis of sediment samples for high molecular weight hydrocarbons. Delta C-13, and total organic carbon. Results of these studies are presented. GRA

N82-16696# Texas A&M Univ., College Station. Dept. of Oceanography.
NORTHERN GULF OF MEXICO TOPOGRAPHIC FEATURES STUDY. VOLUME 5: FLORIDA MIDDLE GROUND Final Report
Mar. 1981 268 p refs 6 Vol.
(Contract DI-AA550-CT8-35)
(PB81-248692; TR-81-2-T-Vol-5; BLM-YM-P/T-81-011-3331-Vol-5) Avail: NTIS HC A12/MF A01; also available in set of 6 reports HC E99 as PB81-248635 CSCL 08J

This chapter provides an integrated multidisciplinary overview of the Florida Middle Ground. The overview is designed to integrate complete geophysical mapping with site specific submarine ground truthing, geological sampling, physical oceanographic, in situ, and time series recording, and biological and chemical sampling. The geophysical, physical, and geological data are used to describe the setting for biological data. The collection of biological data itself was designed around management concepts to address two diverse management objectives. GRA

N82-16697# SRI International Corp., Menlo Park, Calif.
AN EXPERIMENTAL PROGRAM TO PROVIDE REMOTE MEASUREMENT AND ANALYSIS OF OCEAN WAVES, SEA LEVEL WINDS AND BALANCED PRESSURE IN SUPPORT OF SEASAT-A Final Report
J. W. Maresca, Jr., R. M. Endlich, C. T. Carlson, and D. E. Wolf
Feb. 1981 50 p refs
(Contract NA79SA-C-00738; SRI Proj. 8808)
(PB81-246035; NOAA-81071410) Avail: NTIS HC A03/MF A01 CSCL 08C

Wide Aperture Research Facility (WARF) HF skywave radar and Seasat-A measurements of rms wave height and wind direction were compared for 17 July and 3 October 1978. Estimates of rms wave height were made during the 2 October period from skywave radar data recorded directly below the satellite. Sea level balanced pressure fields were computed from the Seasat-A satellite scatterometer (SASS) derived wind field on both days and compared to the National Weather Service (NWS) surface pressure charts. GRA

N82-16698# National Ocean Survey, Rockville, Md.
TIDE TABLES 1982 HIGH AND LOW WATER PREDICTIONS. EAST COAST OF NORTH AND SOUTH AMERICA INCLUDING GREENLAND
1981 292 p
(PB81-241622; NOAA-81070702) Avail: NTIS HC A13/MF A01 CSCL 08C

Full daily predictions for 48 reference ports and differences and other constants for about 2,000 stations in North America, South America, and Greenland are contained. Tables for obtaining the approximate height of the tide at any time, local mean time of sunrise and sunset for every 5th day of the year for different latitudes, the reduction of local mean time to standard time, moonrise and moonset for 8 places, and the Greenwich mean time of the Moon's phases are also contained. Apogee, perigee, greatest north and south and zero declination, the time of the solar equinoxes and solstices, and a glossary of terms are included. GRA

N82-16699# National Weather Service, Silver Spring, Md.
AN INTRODUCTION TO SEA STATE FORECASTING
Graham P. Britton (Royal Navy) and Kenneth E. Lilly, Jr., ed.
1980 229 p refs
(Contract DOC-7-35218)
(PB81-242687) Avail: NTIS HC A11/MF A01; HC Avail: SOD CSCL 08C

The forecasting of sea states is shown to be dependent upon an analysis of the relationships existing between the atmosphere and the ocean. Observation and measurement of the sea and swells, and the structure of the atmosphere overlying the sea surface are discussed. The effects of variations in air and water density on sea and swell generation are examined as well as the dynamics of the atmospheric boundary layer and the effect of fronts. The use of wave spectra data in marine synoptic analysis, the monitoring of cold air outbreaks, and the theoretical treatment of waves are discussed. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-16700# Oak Ridge National Lab., Tenn. Biology Div.
POSSIBLE MECHANISM FOR CHEMICAL INDUCTION OF CHROMOSOME ABERRATIONS IN MALE MEIOTIC AND POSTMEIOTIC GERM CELLS OF MICE
Walderico M. Generoso 1981 16 p refs Presented at 4th Intern. Symp. of the Radiation Biol. Center, Kyoto, 28 Sep. 1981 Sponsored in part by EPA
(DE81-031999; CONF-810966-1) Avail: NTIS HC A02/MF A01

The mechanisms by which chemically induced lesions in the chromosomes of mammalian germ cells are actually converted to aberrations and transmitted to progeny are investigated. An attempt is made to explain how dominant-lethal mutations and heritable translocations are produced from chemical treatment of meiotic and postmeiostic germ cells of male mice. DOE

N82-16701# Environmental Protection Agency, Corvallis, Oreg. Environmental Research Lab.
VARIATION IN PLANT RESPONSE TO OZONE: A CONCEPTUAL MODEL OF PHYSIOLOGICAL EVENTS
D. T. Tingey and G. E. Taylor, Jr. 1980 47 p refs Presented at 32nd Symp. on Effects of Gaseous Air Pollution in Agr. and Hort., Nottingham, England, 1 Sep. 1980 Prepared in cooperation with Oak Ridge National Lab.
(Contract W-7405-eng-26)
(DE81-029692; CONF-8009172-1) Avail: NTIS HC A03/MF A01

The environment and genotype exert profound influences on a plant's ozone response. Based on the multiplicity of physiological mechanisms responsible for variable response, a common progression of events is proposed: ozone conductance (gas and liquid phase), perturbation, homeostasis, and injury. Injury is the repercussion of the preceeding events. Gas and liquid phase conductances are significant sources of variable ozone response. Genic expression and environmental stimuli affect ozone conductance and homeostasis and thereby the extent of injury. Based on conceptual model, gas phase conductance would be the decisive factor controlling injury only if it were the rate limiting step. Any physiologically significant intervening event between gas-phase conductance and injury would reduce the association between them. Either liquid phase conductance of homeostasis could reduce that association. DOE

N82-16702# Colorado State Univ., Fort Collins. Dept. of Microbiology.
MICROBIOLOGICALLY-MEDIATED MUTAGENIC ACTIVITY OF CRUDE OIL Final Report, 1976 - 1979
Bruce A. Cummings and Ronald C. Gordon Sep. 1981 302 p refs
(Grant EPA-R-805041)
(PB82-105131; EPA-600/3-81-053) Avail: NTIS HC A14/MF A01 CSCL 06T

Crude oil was incubated with raw and sterile river water samples and assayed for mutagenic activity for the Ames test to determine the ability of naturally occurring freshwater microorganisms to form mutagenic biodegradation products from

crude oil. River water samples supplements with inorganic salts were incubated with one percent crude oil in Erlenmeyer flasks for 1-6 weeks and 4 and 20 C with shaking. Replicate flasks were extracted at various time intervals with 1,1-2 trichloro-1,2,2-trifluoroethane, the solvent evaporated and the residues taken up in dimethyl sulfoxide for mutagenicity testing. The extracts were assayed for mutagenic activity by the plate incorporation method of the Ames test with Salmonella tester strains TA 100, TA 1535, TA 1537, TA 1538 and TA 98. Mammalian liver microsomes were not used in the mutagenicity test system as the oil degrading microorganisms constituted the enzyme activation system in the study. GRA

N82-16703# Cincinnati Univ., Ohio. Inst. of Environmental Health.

MECHANISMS OF CADMIUM ABSORPTION IN RATS

Ernest. C. Foulkes, D. R. Johnson, Naoki Sugawara, Roland F. Bonewitz, and Cathleen Voner Sep. 1981 59 p refs (Grant EPA-R-805840)

(PB82-108184; EPA-600/1-81-063) Avail: NTIS HC A04/MF A01 CSCL 06T

The study was undertaken in order to help clarify the factors which determine the fractional absorption of an oral load of cadmium (Cd) from the intestine of the rat. The experiments utilized intact segments of intestine, perfused or incubated in situ, with their blood supply intact. Absorption of Cd from the jejunal lumen can be ascribed to a saturable membrane system, that is after short periods of exposure essentially all the metal removed from the lumen was recovered in mucosal issue (Step 1). The second step in Cd absorption, i.e., transfer of the metal from mucosa into blood, proceeded at only 1-2% of the rate of uptake from the lumen (Step 1). No evidence was obtained for a role of metal lothionein in the mucosal retention of Cd. Step 1 of Cd absorption was inhibited by a variety of exogenous and endogenous factors. Thus, zinc was found to depress Cd transport in an apparently competitive manner. Addition of milk to the lumen also inhibited Cd uptake, an effect entirely due to the Ca content. Bile salts act as endogenous modulators of Cd absorption; their effect may be related to micelle formation. The research also included studies of duodenal and ileal Cd transport. GRA

N82-16704# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 15, NO. 6, NOVEMBER - DECEMBER 1981

12 Jan. 1982 154 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med (Moscow), v. 15, no. 6, Nov. - Dec. 1981 (JPRS-79849) Avail: NTIS HC A08/MF A01

Articles are presented which address life support systems; human and animal physiological responses to spacecraft environments, radiation and weightlessness; and flight fatigue in helicopter crews. For individual titles, see N82-16705 through N82-16730.

N82-16705# Joint Publications Research Service, Arlington, Va.

QUESTION OF REDISTRIBUTION OF BLOOD IN ORTHOSTATIC POSITION **c52**

G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 1-9 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 4-9 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The concept of two interacting constituents involved in the redistribution of the circulating blood volume in orthostasis, redistribution along the vertical (hydrostatic) and functional (metabolic) gradients, is discussed. On this basis, the possible mechanism responsible for orthostatic circulatory intolerance following an exposure to bed rest or weightlessness is described. Author

N82-16706# Joint Publications Research Service, Arlington, Va.

WAYS AND MEANS OF MAINTAINING HEAT BALANCE IN PILOTS AND COSMONAUTS **c52**

A. S. Barer *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 10-18 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 9-15 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Different principles used in systems ensuring thermal balance of pilots and cosmonauts are discussed. Physiological and hygienic characteristics of the passive thermal insulation, ventilation systems, and liquid cooling (heating) suits are presented. A classification of the means and methods is proposed. Author

N82-16707# Joint Publications Research Service, Arlington, Va.

SYSTEMIC AND CEREBRAL HEMODYNAMICS IN FLIGHT PERSONNEL EXPOSED TO MODERATE HYPOXIA **c52**

V. N. Denisov, S. F. Rayev, and I. I. Antufyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 19-23 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 16-19 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

For the purposes of medical expertise the state of systemic and cerebral hemodynamics was investigated in 66 pilots with autonomic-vascular instability and in 36 healthy subjects exposed to moderate hypoxia (in an altitude chamber). The pilots showed noticeable tachycardia or systolic hypertension, as well as certain changes in cardiac output and stroke volume. These alterations were accompanied by rheoencephalographic changes of two types one of which can be regarded as an adverse response of cerebral circulation to hypoxia. It is concluded that the study of systemic and cerebral circulation in hypoxia yields important diagnostic information that allows better estimates. M.G.

N82-16708# Joint Publications Research Service, Arlington, Va.

CAUSES OF FATIGUE AMONG CREWS OF CIVIL AVIATION HELICOPTERS **c52**

Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 24-27 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 19-22 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The role of vibration and noise in the development of fatigue in helicopter crews was assessed. The exposure to these factors during the flying shift results in an early and marked fatigue of pilots the level of which depends on the vibration effects to a larger extent than on the noise effects. The fatigue is followed by a decline of the psychophysiological parameters characterizing the visual and motor functions as well as the ratio of the basic processes in the central nervous system. M.G.

N82-16709# Joint Publications Research Service, Arlington, Va.

PHYSIOLOGICAL AND HYGIENIC EVALUATION OF VIBRATION IN THE COCKPIT OF A CARGO HELICOPTER **c54**

Yu. G. Matveyev and Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 28-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 22-25 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The correlations between statistical parameters of vibration in the work place, work schedules, and functional state of subjects when performing commercial flights were studied. In the cockpit of five helicopters the floor and the chair vibrated in a band of 8 Hz at a frequency of 112.5 and 114.0 dB, respectively. Before and after the flying shift 66 crewmembers were interviewed and examined. Vibration was referred to as the most unpleasant factor by 30.4% of them, noise was defined as the most unpleasant factor by 6.5% of them; 63.1% described both factors as similarly adverse. The level of psychophysiological changes was proportional to the flight time. The first signs of fatigue were seen after

flights of up to 5 hours in duration, to increase drastically after flights of 6 and 7 hours. M.G.

N82-16710# Joint Publications Research Service, Arlington, Va.

EVALUATION OF MAN'S ENDURANCE OF LOCAL PRESSURE TO THE HEAD AND OBJECTIVE ASSESSMENT OF HYGIENIC SPECIFICATIONS FOR PROTECTIVE HELMETS **c52**

V. M. Sinigin, Yu. G. Konakhevich, L. N. Sholpo, and A. I. Uglanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 33-37 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 25-28 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

To obtain reference data for a statistically substantiated evaluation of man's tolerance to the local pressure on the head (as applied to protective helmets kept on for a long time), 86 experiments were carried out in which 11 test subjects participated. The local pressure of 0.05 to 0.5 kg/sq cm was applied to eight areas of the head. The tolerance time was measured as the time interval from the beginning of the exposure to the emergence of localized sensations of the type: unpleasant, painful, very painful, or intolerable. As a result, statistically significant relationships between the tolerance time and the level of the local pressure were obtained for the eight locations and four grades of subjective sensations. These data can be used in evaluating protective helmets to be worn for a long time as well as in developing hygienic requirements for the advanced helmet-like devices. Author

N82-16711# Joint Publications Research Service, Arlington, Va.

EFFECT OF TRANSMERIDIONAL FLIGHTS ON BIORHYTHM OF ZONE FORMATION BY STREPTOMYCES LEVORIS **c52**

A. P. Savelyev, A. Kh. Akhmadiyeva, and I. G. Akoyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 38-41 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 28-31 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The transmeridioneal transportation of the temperature controlled colonies of Streptomyces levoris exerted a marked effect on its biorhythms. This included changes in the growth and zone formation rates and differences in the vector of changes as related to the flight direction. The vector of changes during an east-oriented airborne flight coincided with that in orbital flight with a similar direction of transportation. These findings as well as the results of studies of seasonal and diurnal rhythms of the actinomycete zone formation suggest the synchronizing effect of the periodicity of geophysical factors. M.G.

N82-16712# Joint Publications Research Service, Arlington, Va.

SIMULATION OF SOME OF MAN'S MOVEMENTS IN DIFFERENT GRAVITY FIELDS **c54**

A. V. Zinkovskiy, I. A. Trofimova, and V. A. Chistyakov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 42-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 31-33 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The control of man's movements during adaptation to an altered gravity field was modeled by mathematical methods. Two types of movements were investigated: forearm displacement with various loads and repulsions from a support in zero-G and at high G's. It was shown that movement coordination in altered gravity fields can be maintained due to a rearrangement of the control over muscle contraction which includes changes in the amplitude and pattern of joint momenta in harmony with the gravity changes. M.G.

N82-16713# Joint Publications Research Service, Arlington, Va.

POSITIONS, MOVEMENTS AND EQUILIBRIUM OF RATS AFTER FLIGHTS ABOARD BIOSATELLITES

G. S. Ayzikov and A. S. Markin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 46-53 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 33-38 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

An examination of the Wistar-SPF rats flown onboard the biosatellites Cosmos-782, 936 and 1129 demonstrated significant changes in their postural, motor, and equilibrium reactions. The use of artificial gravity inflight produced a beneficial effect on the health state, motor activity, and simple reflex acts of the animals but worsened their movement coordination and equilibrium function. M.G.

N82-16714# Joint Publications Research Service, Arlington, Va.

CATHEPSIN ACTIVITY OF SKELETAL MUSCLE AND MYOCARDIA MYOFIBRILS AFTER EXPOSURE TO WEIGHTLESSNESS AND ACCELERATIONS

S. S. Oganesyan and M. A. Eloyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 54-59 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 38-42 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The rats flown onboard Cosmos-605 and exposed to a synchronous experiment for 22 days showed an increased activity of myofibrillar cathepsins in skeletal muscles of different groups. In the flight rats the increase was greater than in the synchronous ground-based animals. This suggests a significant effect of weightlessness on the cathepsic activity. The parameter was partially normalized at R+ 25 or 26 days. The exposure of rats to accelerations of 4 and 5 G for 2 min daily during 2 weeks also increased the cathepsic activity of skeletal and myocardial myofibers. The parameter returned to normal a month after completion of acceleration exposures. Thus, changes in the proteolytic activity of myofibers of different muscles induced by weightlessness and acceleration are reversible. The significance of changes in the muscle tension as related to the mechanism of stimulation of proteolytic reactions is discussed. M.G.

N82-16715# Joint Publications Research Service, Arlington, Va.

CYTOKINETIC EVALUATION OF ERYTHROPOIESIS DURING LONG-TERM ORBITAL FLIGHTS **c52**

A. V. Ilyukhin and T. Ye. Vurkovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 60-64 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 42-46 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The mechanisms of erythropoietic changes at the cellular level during a prolonged exposure to weightlessness were investigated. Following 96-, 140- and 175-day space flights cytokinetic and morphological changes in erythropoiesis were observed. The count of circulating erythrocytes decreased inflight and their life time reduced postflight. The shortening of the life time of erythrocytes postflight was paralleled by increased proliferative activity of erythroid cells. The erythrocytic balance was not reached as late as R+36 days. B.W.

N82-16716# Joint Publications Research Service, Arlington, Va.

NOREPINEPHRINE AND ENZYMES OF SYNTHESIS AND DEGRADATION THEREOF IN THE RAT HYPOTHALAMUS FOLLOWING FLIGHT ABOARD THE COSMOS-936 BIOSATELLITE

T. Torda, R. Kvetnyanski, R. A. Tigranyan, Yu. Chulman, and A. M. Genin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 65-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 46-48 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

In the hypothalamus of weightless and centrifuged rats flown for 18.5 days onboard the biosatellite Cosmos-936, the noradrenaline concentration and activity of the enzymes involved in the catecholamine synthesis and degradation were measured. It was found that under the space flight influence the noradrenaline concentration and tyrosine hydroxylase, dopamine-beta-hydroxylase, and monoamine oxidase activities remained unaltered. These findings indicate that a prolonged exposure to weightlessness was not a stressogenic agent that could activate the adrenergic system in the rat hypothalamus. B.W.

N82-16717# Joint Publications Research Service, Arlington, Va.

HYGIENIC PRINCIPLES OF ONGOING MONITORING OF QUALITY OF RECYCLED WATER DURING SPACE FLIGHTS **c54**

V. M. Skuratov, V. B. Gaydadymov, and S. V. Chizhov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 69-72 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 181 p 48-51 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The hygienic principles used in the evaluation of the quality of reclaimed water onboard the spacecraft are presented. The parameter required for operational control and their hygienic significance are discussed. Author

N82-16718# Joint Publications Research Service, Arlington, Va.

TOXICOLOGICAL AND HYGIENIC ASPECTS OF IMPROVING ADDITIONAL PURIFICATION OF WATER RECLAIMED FROM URINE **c54**

Z. P. Pak, G. V. Lobacheva, M. M. Spiryayeva, Yu. Ye. Bezumova, T. P. Korotkova, V. P. Petina, and Ye. S. Yevdokimova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 73-78 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 51-54 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Comparative toxicological and hygienic studies of samples of reclaimed water obtained from urine with the use of different final purification variants were conducted. The sorption-catalytic method of urine condensate repurification using a platinum-carbon catalyst proved to be the most promising since it can ensure the production of toxicologically safe potable water. It was shown experimentally that the quality of reclaimed water as related to its chemical and toxicological parameters depends on the efficiency of the repurification unit. B.W.

N82-16719# Joint Publications Research Service, Arlington, Va.

POSSIBLE USE OF HOUSE FLY LARVAE FOR UTILIZATION OF ORGANIC WASTE IN BIOLOGICAL LIFE-SUPPORT SYSTEMS **c54**

Ye. G. Golubeva and T. V. Yerofeyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, v. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 79-83 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 54-57 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Musca domestica larvae were grown in organic substrates of three types. The larval density was shown to influence certain parameters characterizing the fly life cycle and the larval utilization of the substrate. The larval development led to a decrease of the substrate mass, humidity and the content of organic matter. Man's native excrements were found to be the best substrate for M. domestica larvae. Author

N82-16720# Joint Publications Research Service, Arlington, Va.

DISTINCTIONS OF REGENERATION OF CONFINED ATMOSPHERE BY MEANS OF PHOTOSYNTHESIS OF UNICELLULAR ALGAE **c54**

G. I. Meleshko, L. M. Krasotchenko, and Ye. K. Lebedeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 84-90 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 58-62 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Systems of biological air regeneration using photosynthesis of unicellular algae are examined. An oxygen-carbon dioxide mismatch associated with the difference in gas exchange coefficients of man and algae is shown. The value and vector of the mismatch depend on the degree of the above difference. In the system balanced with respect to oxygen consumption and carbon dioxide production, the rate of the mismatch equals to 1 per cent of either process per each unit of the difference of the gas exchange coefficients in the second decimal point. Methods for regulating the algal assimilation coefficient based on the use of various nitrogen forms for algal nutrition and controlled biosynthesis are discussed. Optimal variants of gas exchange balance in the semi-closed biological life support systems are described. B.W.

N82-16721# Joint Publications Research Service, Arlington, Va.

PHENOMENA OF FLUCTUATION OF HUMAN REACTION TO ANTIORTHOSTATIC POSITION **c52**

L. Lkhagva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 91-94 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 63-65 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The biorhythmological analysis of the data obtained from seven healthy male test subjects in the head-down position at -8 deg revealed phemonena of sine-shaped reactions. This pattern was seen in the range (the difference between mean day-time and mean night-time values) of heart rate, amplitude (the difference between the maximum and minimum) of variations of body temperature and renal potassium excretion, and the evening-morning difference of body temperature variations. Author

N82-16722# Joint Publications Research Service, Arlington, Va.

RESULTS OF STUDY OF HEMODYNAMICS AND PHASE STRUCTURE OF THE CARDIAC CYCLE DURING FUNCTIONAL TEST WITH LOWER BODY NEGATIVE PRESSURE DURING 140-DAY SALYUT-6 STATION FLIGHT **c52**

A. D. Yegorov, O. G. Itsekhovskiy, I. I. Kasyan, A. P. Polyakova, V. F. Turchaninova, I. V. Alferova, V. G. Savelyeva, M. V. Domracheva, V. G. Doroshev, Ye. A. Kobzev et al *In its* USSR Rept.: Space Biol. and Aerospace Med. Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 95-100 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 65-69 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The two members of the 140-day permanent Salyut-6 space flight were exposed to five lower body negative pressure (LBNP) tests at -25 and -35 mm Hg for 2 and 3 min, respectively. Circulation responses to the LBNP tests were measured with respect to the heart rate, arterial pressure, chronocardiogram, and cardiac output. As compared to the preflight data, inflight responses were characterized by a greater tachycardia, preload insufficiency, and vascular tone in the absence of orthostatic intolerance. Possible mechanisms of the changes in the circulation responses are discussed. Author

N82-16723# Joint Publications Research Service, Arlington, Va.

SUCCINATE DEHYDROGENASE AND CYTOCHROME OXIDASE ACTIVITY IN TISSUES OF RATS SUBMITTED TO LONG-TERM HYPOKINESIA

V. V. Smirnov and P. P. Potapov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 101-103 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 69-71 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The activity of cytochrome oxidase in the liver, skeletal muscles, kidneys, brain and lungs of 56 white rats decreased on days 15 and 60 of the hypokinetic study. The activity of succinate dehydrogenase significantly lowered in the brain and slightly diminished in the lungs and skeletal muscles on the same days. The activity of succinate dehydrogenase in the liver increased on the 90th hypokinetic day. Author

N82-16724# Joint Publications Research Service, Arlington, Va.

LIPID SPECTRUM OF THE MYOCARDIUM OF WHITE RATS EXPOSED TO HYPOXIC HYPOXIA

S. A. Sergeyev and G. A. Gribanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 104-108 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 71-74 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

By a modified microthin-layer chromatography the total lipid spectrum of the cardiac muscle of white rats exposed to acute oxygen deficiency in an altitude chamber was investigated. It was found that the content of total lipids, phospholipids, free cholesterol, free fatty acids and triglycerides decreased during acute hypoxia. The exposure induced changes in the amount of glycerophosphatids, phosphatid acids and polyglycerophosphatids whose content diminished significantly. The concentration of phosphatidyl serines and phosphatidyl ethanol amines lowered to a lesser extent while that of sphyngomyelins increased. Acute oxygen deficiency accelerates the release of inorganic phosphate from the heart, thus, together with other factors, leading to disorders in the heart energetics. These findings indicate an important role of hypoxic hypoxia in the disturbances of lipid metabolism of the myocardium. This needs to be taken into consideration in the diagnostics and treatment of such states. Author

N82-16725# Joint Publications Research Service, Arlington, Va.

STATIONARY MAGNETIC FIELDS AND RETICULAR INFLUENCES ON ADRENERGIC AND CHOLINERGIC SYSTEMS

L. D. Klimovskaya and A. F. Maslova *In its* USSR Rept.: Space Biol. and Aerospace Med. Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 109-112 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 74-76 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

An exposure of rabbits to a constant magnetic field of 0.4 T for one hour caused increases in the blood content of adrenaline, noradrenaline, and acetylcholine, and in the adrenal content of adrenaline. Stimulation of the midbrain reticular formation led to a significant increase of the blood concentration of catecholamines and acetylcholine. After an exposure to the constant magnetic field the stimulatory effects of the reticular formation on the adrenergic systems diminished and on the cholinergic systems remained elevated. R.J.F.

N82-16726# Joint Publications Research Service, Arlington, Va.

CLINICAL DISTINCTIONS OF RADIATION SICKNESS WITH EXPOSURE OF DIFFERENT PARTS OF THE HUMAN BODY TO RADIATION c52

G. F. Nevskaya, G. M. Abramova, M. A. Volkova, Ye. V. Kavlycheva, A. S. Skorik, and V. V. Yurogov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 113-118 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 77-80 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The clinical picture of radiation sickness of 139 radiological patients exposed to local irradition of the head, chest, and stomach with efficient doses of 210 rad was examined. It was found that at fractionated local irraditions the clinical symptom-complex of radiation sickness was identifical to that seen as a result of total-body irradiation. During head irradiation the major symptom was headache and during stomach irradiation nausea. The severity level of radiation damage measured with respect to the clinical symptom-complex as a whole with the aid of the bioinformation model was similar during irradiations of the head and stomach, much higher during irradiation of the chest. During head and stomach irradiations the severity level of radiation damage was proportional to the efficient dose. During chest irradiation there was no correlation between the severity level and the exposure to doses of 210 rad. Author

N82-16727# Joint Publications Research Service, Arlington, Va.

METHOD OF RECORDING ROTATORY EYE REFLEXES c52

M. M. Levashov and A. V. Dmitriyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 119-122 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec 1981 p 80-82 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

A method of recording rotatory eye reflexes in real time using polarized light is described. When a beam of light going to the photodetector is passed successively through two polarizers, illumination of the detector will depend on reciprocal orientation of polarization planes. Reciprocal rotation of polarization planes alters illumination proportionally to the cosine of angle of rotation. When the planes are parallel (0 degree angle), illumination is at a maximum, and when one of the planes is rotated 90 degrees in relation to the other, it is minimal. A miniature photoresistor is used as a detector, and it is covered with polarizing layer. The detector is placed on the anesthetized eyeball with suction cups. The light source and miniaturized amplifier unit were assembled on a mask worn over the subject's head. R.J.F.

N82-16728# Joint Publications Research Service, Arlington, Va.

ELECTRODE UNIT FOR TESTING HUMAN H REFLEX c52

V. I. Zborovskaya and E. A. Skiba *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 123-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 82-83 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Use of a method of recording H reflexes that makes it possible to test the level of reflex activity of spinal motoneurons at rest and during movement, as well as to make qualitative and quantitative evaluations of various supraspinal and afferent factors is discussed. An electrode unit for electrostimulation of peripheral nerves or muscles was made. It has 6 electrodes 8-10 mm in diameter, which are mounted on an elastic dielectric plate. Rounded corners of the plate protect the skin from trauma when the electrode unit is secured firmly. The electrode unit is secured firmly to the region of the popliteal fossa, connected to the electrosimulator through a selector which connects the unit electrodes one after the other. The stimulation point is determined from the nature and magnitude of responses elicited in the muscle innervated by the stimulated nerve. R.J.F.

N82-16729# Joint Publications Research Service, Arlington, Va.

COMPARATIVE ANTIHYPOXIC EFFICACY OF PRESSURE CHAMBER CONDITIONING AND FASTING OF MAN c52

A. Yu. Katkov, Ye. A. Kovalenko, R. N. Chabdarova, G. A. Davydov, S. A. Vtoryy, and N. M. Utkina *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 125-128 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 84-86 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

Two theoretically possible means of enhancing man's resistance to rapidly increasing hypoxia, pressure chamber conditioning and fasting, are studied. Eleven essentially healthy men were divided into two groups. The first group of subjects was submitted to 10-day pulsed pressure chamber conditioning. The second group of subjects spent 14 days on a total fast,

without limiting water intake. Endurance of hypoxia in the first group was determined before pressure chamber conditioning and immediately after it, and in the second group before the fast and on the 14th day of food deprivation. The subject was raised continuously in the chamber at the rate of 20 m/s at rest, to maximum tolerance of altitude. The subject was raised again at the same speed 30 minutes after descending to 'Earth', but with concurrent performance of exercise on a bicycle ergometer constituting 200 kg-m/minutes. In both cases, the subject had to report the current 'altitude when so instructed. In the course of the test, a continuous recording of oxygen tension in the skin of the left forearm was made by the polarographic method. At normal barometric pressure, body weight, gas exchange, morphological and gas composition, and acid-base equilibrium of capillary blood was determined. R.J.F.

N82-16730# Joint Publications Research Service, Arlington, Va.

CONDITION OF MENINGEAL NERVOUS SYSTEM DURING REPEATED EXPOSURE TO TRANSVERSE ACCELERATIONS c52

G. A. Konstantinovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec 1981 (JPRS-79849) 12 Jan. 1982 p 129-132 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 86-88 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

The nerve elements of the dura and pia mater of the brain of 19 puberal cats weighing 2 to 3 kg were examined following repeated exposure to transverse accelerations (chest-back) for 20 minutes at 24-hour intervals, for 6 days. A force of 8 units with a gradient of acceleration build-up and decline of 0.5 to 0.4 unit/s was generated on a centrifuge with a 5 m arm, equipped with specially molded containers, in which the animals were immobilized in their physiological position. The cats were sacrificed using ether fumes at different times after the experiments: 1, 3, 7, 30 and 90 days, which enabled experimentors to track the dynamics of recovery processes. The meninges of five intact animals of the same ages and weight served as a control. Nervous elements were demonstrated by means of silver nitrate impregnation according to Bielschowsky, in various modifications, followed by gold-plating and additional staining with nuclear-plasma stains. R.J.F.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-16731* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 226)

Dec. 1981 48 p

(NASA-SP-7011(226)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 129 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1981. Author

N82-16732*# Electro-Optics Consultants, Inc., Huntsville, Ala.

DETECTION OF AMBLYOPIA UTILIZING GENERATED RETINAL REFLEXES Final Report

J. H. Kerr and S. H. Hay 13 Nov. 1981 52 p refs

(Contract NAS8-33819)

(NASA-CR-161944; Rept-5153-33819) Avail: NTIS HC A04/MF A01 CSCL 06E

Investigation confirmed that GRR images can be consistently obtained and that these images contain information required to detect the optical inequality of one eye compared to the fellow eye. Digital analyses, electro-optical analyses, and trained observers were used to evaluate the GRR images. Two and three dimensional plots were made from the digital analyses results. These plotted data greatly enhanced the GRR image content, and it was possible for nontrained observers to correctly identify normal vs abnormal ocular status by viewing the plots. Based upon the criteria of detecting equality or inequality of ocular status of a person's eyes, the trained observer correctly identified the ocular status of 90% of the 232 persons who participated in this program. T.M.

N82-16733# Civil Aeromedical Inst., Oklahoma City, Okla.

FATIGUE IN FLIGHT INSPECTION FIELD OFFICE (FIFO) FLIGHT CREWS

C. E. Melton, J. M. McKenzie, S. M. Wicks, and J. T. Saldivar Apr. 1981 51 p refs

(AD-A106791; FAA-AM-81-13) Avail: NTIS HC A04/MF A01 CSCL 06/19

Studies related to FIFO aircrew stress and fatigue were carried out at seven FIFO's in the Continental U.S. Forty-one men served as subjects and all crew positions were presented. Each crewmember was studied during flight activities and during office based activities. Generally, crews were in travel status during flight inspection activities and away from the office for 5 d. Crewmembers completed fatigue checklists before and after each duty on every workday. Urine specimens were collected that represented the night sleep period and the work period; they were analyzed for 17 ketogenic steroids, epinephrine, and norepinephrine, and values were expressed as weight per hundred milligrams of urinary creatinine. Ambulatory electrocardiograms were recorded for determination of heart rate (HR) during work. The data indicate that office work is distinctly less fatiguing than flight work. This finding is supported by the HR data that indicate a lower workload in the office than in flight. The statement is commonly made by crewmembers that office work is more fatiguing than flight work. It is probable that such statements are based on work preference rather than work level. Some crewmembers at Oklahoma City, Atlanta, Los Angeles, and Battle Creek show severe fatigue associated with flight work. GRA

N82-16734# Desmatics, Inc., State College, Pa.

ACCELERATION MEASURES AND MOTION SICKNESS INCIDENCE

Carl A. Mauro and Dennis E. Smith Nov. 1981 24 p refs Presented at the Intern. Workshop on Res. Methods in Human Motion and Vibration Studies, New Orleans 16-18 Sep. 1981

(Contract N00014-79-C-0128; NR Proj. 207-037)

(AD-A107996; TR-112-10) Avail: NTIS HC A02/MF A01 CSCL 06/19

An important aspect of motion sickness research is to establish quantitative relationships between sickness incidence and various parameters of the motions that induce sickness. At present, however, only wholebody vertical sinusoidal motion has been studied to any reasonable degree. The purpose of this report is to examine the predictive utility of six different characterizations of sinusoidal motion and to investigate their possible extension to dual frequency motion. Author (GRA)

N82-16735# Oak Ridge National Lab., Tenn. Chemical Effects Information Center.

CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA

M. Virginia Cone and Cindy Stroup (EPA) 1981 6 p refs Presented at 2nd EPA/NCI Ann. Collaborative Workshop Environ. and Occupational Cancer Studies, Rockville, Md., 9-11 Sep. 1981

(Contract W-7405-eng-26)

(DE81-030813; CONF-810959-1) Avail: NTIS HC A02/MF A01

Sources of data are from the world literature, retrospective to 1974. Information from approximately 1500 documents is in the data base at the present time. The data base contains information on 750 chemicals. Approximately 10% of the total documents in the file concerned pesticides; 30% drugs; and 40% metals. The remaining 20% were about other substances, including industrial chemicals and organics which are of interest to NCI and EPA. T.M.

N82-16736# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

REVIEW OF LITERATURE AND REGULATION RELATING TO THORACIC IMPACT TOLERANCE AND INJURY CRITERIA Final Report, Jul. 1980 - Jun. 1981

Robert L. Hess, Kathleen Weber, and John W. Melvin Jul. 1981 281 p refs Sponsored in part by Motor Vehicle Manufacturers Association
(PB82-108697; UM-HSRI-81-38) Avail: NTIS HC A13/MF A01 CSCL 06S

The technical and scientific literature dealing with thoracic injury to or within the rib cage, from blunt loading is reviewed. The history of the development of associated Federal Motor Vehicle Safety Standards is reviewed from the aspect of its relationship to the history of development of the research information. Field case data from car-to-car and car-to-tree/pole crashes has been examined and summarized. This study suggests that the laboratory research has not adequately covered the principal variables found to exist in actual injury cases. Specifically more research attention should be given to the shape of the impactor, to the loading location and directory, and to injuries in the contusion and/or laceration family. Correspondingly, the accident investigation process needs to be more sensitive to occupant/vehicle interior interaction variables so that laboratory research can be properly guided. GRA

N82-16737# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
HUMAN REACTIONS TO ELF ELECTRIC AND MAGNETIC FIELDS: AN ANNOTATED BIBLIOGRAPHY OF CURRENT LITERATURE
J. Patrick Reilly Jul. 1981 42 p
(PB82-102567; PPSP/JHU/PPSE-T-20) Avail: NTIS HC A03/MF A01 CSCL 06P

This annotated bibliography lists current literature (since 1960) which applies to human reactions to electric and magnetic fields from 10 Hz to 100 Hz, with an emphasis on power frequency fields. This includes direct experimental work with humans, epidemiological studies, work which uses animal studies to draw interferences about human reactions, studies concerning human dosimetry, and works which discuss means for human protection. GRA

N82-16738# Centro Informazioni Studi Esperienze, Milan (Italy).
IN VIVO RECORDING OF BLOOD VELOCITY PROFILES AND STUDIES IN VITRO OF PROFILE ALTERATIONS INDUCED BY KNOWN STENOSES
M. Bassini, E. Gatti (Politecnico di Milano), T. Longo (Milan Univ.), G. M. Martinis, P. Pignoli (Milan Univ.), and P. L. Pizzolati 1980 36 p refs Presented at the 4th Intern. Conf. of the Cardiovascular System Dyn. Soc. Peripheral Vascular Hemodyn.: Basic and Clinical Aspects, Miami, Fla., 12-15 Nov. 1980
(PB81-244139; CISE-1655) Avail: NTIS HC A03/MF A01 CSCL 06B

Measurements were obtained with a pulsed ultrasonic instrument based on the analysis of the cross-correlation function of blood diffused echoes. The alterations and velocity in the time domain were studied in vitro as function of the distance between stenosis and measuring point, and position of the sample volume along the diameter. These studies may be useful for a better comprehension of blood velocity measurements made with ultrasound equipments for clinical non-invasive diagnostic purposes. T.M.

N82-16705# Joint Publications Research Service, Arlington, Va.
QUESTION OF REDISTRIBUTION OF BLOOD IN ORTHOSTATIC POSITION
G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 1-9 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 4-9 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16706# Joint Publications Research Service, Arlington, Va.
WAYS AND MEANS OF MAINTAINING HEAT BALANCE IN PILOTS AND COSMONAUTS
A. S. Barer *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 10-18 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 9-15 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16707# Joint Publications Research Service, Arlington, Va.
SYSTEMIC AND CEREBRAL HEMODYNAMICS IN FLIGHT PERSONNEL EXPOSED TO MODERATE HYPOXIA
V. N. Denisov, S. F. Rayev, and I. I. Antufyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 19-23 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 16-19 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16708# Joint Publications Research Service, Arlington, Va.
CAUSES OF FATIGUE AMONG CREWS OF CIVIL AVIATION HELICOPTERS
Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 24-27 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 19-22 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16710# Joint Publications Research Service, Arlington, Va.
EVALUATION OF MAN'S ENDURANCE OF LOCAL PRESSURE TO THE HEAD AND OBJECTIVE ASSESSMENT OF HYGIENIC SPECIFICATIONS FOR PROTECTIVE HELMETS
V. M. Sinigin, Yu. G. Konakhevich, L. N. Sholpo, and A. I. Uglanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 33-37 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 25-28 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16711# Joint Publications Research Service, Arlington, Va.
EFFECT OF TRANSMERIDIONAL FLIGHTS ON BIORHYTHM OF ZONE FORMATION BY STREPTOMYCES LEVORIS
A. P. Savelyev, A. Kh. Akhmadiyeva, and I. G. Akoyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 38-41 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 28-31 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16715# Joint Publications Research Service, Arlington, Va.
CYTOKINETIC EVALUATION OF ERYTHROPOIESIS DURING LONG-TERM ORBITAL FLIGHTS
A. V. Ilyukhin and T. Ye. Vurkovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 60-64 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 42-46 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16721# Joint Publications Research Service, Arlington, Va.
PHENOMENA OF FLUCTUATION OF HUMAN REACTION TO ANTIORTHOSTATIC POSITION
L. Lkhagva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 91-94 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 63-65 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16722# Joint Publications Research Service, Arlington, Va.
RESULTS OF STUDY OF HEMODYNAMICS AND PHASE STRUCTURE OF THE CARDIAC CYCLE DURING FUNC-

TIONAL TEST WITH LOWER BODY NEGATIVE PRESSURE DURING 140-DAY SALYUT-6 STATION FLIGHT
A. D. Yegorov, O. G. Itsekhovskiy, I. I. Kasyan, A. P. Polyakova, V. F. Turchaninova, I. V. Alferova, V. G. Savelyeva, M. V. Domracheva, V. G. Doroshev, Ye. A. Kobzev et al *In its* USSR Rept.: Space Biol. and Aerospace Med. Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 95-100 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 65-69 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16726# Joint Publications Research Service, Arlington, Va.
CLINICAL DISTINCTIONS OF RADIATION SICKNESS WITH EXPOSURE OF DIFFERENT PARTS OF THE HUMAN BODY TO RADIATION
G. F. Nevskaya, G. M. Abramova, M. A. Volkova, Ye. V. Kavlycheva, A. S. Skorik, and V. V. Yurogov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 113-118 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 77-80 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16727# Joint Publications Research Service, Arlington, Va.
METHOD OF RECORDING ROTATORY EYE REFLEXES
M. M. Levashov and A. V. Dmitriyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 119-122 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec 1981 p 80-82 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16728# Joint Publications Research Service, Arlington, Va.
ELECTRODE UNIT FOR TESTING HUMAN H REFLEX
V. I. Zborovskaya and E. A. Skiba *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 123-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 82-83 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16729# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANTIHYPOXIC EFFICACY OF PRESSURE CHAMBER CONDITIONING AND FASTING OF MAN
A. Yu. Katkov, Ye. A. Kovalenko, R. N. Chabdarova, G. A. Davydov, S. A. Vtoryy, and N. M. Utkina *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 125-128 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 84-86 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16730# Joint Publications Research Service, Arlington, Va.
CONDITION OF MENINGEAL NERVOUS SYSTEM DURING REPEATED EXPOSURE TO TRANSVERSE ACCELERATIONS
G. A. Konstantinovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec 1981 (JPRS-79849) 12 Jan. 1982 p 129-132 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 86-88 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-16739# Rice Univ., Houston, Tex. Dept. of Psychology.
CHOOSING AMONG ALTERNATIVES WITH UNCERTAIN OUTCOMES: EFFECT OF PRIOR CURING AND ESTIMATION REQUIREMENTS
Shanta P. Kerkar and William C. Howell Aug. 1981 45 p refs
(Contract N00014-78-C-0555; NR Proj. 197-050)
(AD-A106143; TR-81-2) Avail: NTIS HC A03/MF A01 CSCL 05/1

Previous investigations by the authors have shown that judgments of frequency or probability have a facilitatory influence on subsequent predictive choice performance. The present study examined both these judgement processes more closely in an attempt to understand how they affect choices. Five groups of subjects served as emergency vehicle dispatchers for a hypothetical city. The experimental design involved a 2 x 2 factorial combination of response set and estimation task. More specifically, response set, defined as expectation of a frequency or probability response requirement, was crossed with actual response requirement, either frequency or probability estimation, in a between-groups design.
Author (GRA)

N82-16740# RAND Corp., Santa Monica, Calif.
AN ANALYSIS OF COGNITIVE MAPPING SKILL Interim Report
Perry W. Thorndyke and Sarah E. Goldin Mar. 1981 66 p refs
(Contract MDA903-79-C-0549)
(AD-A106145; RAND/N-1664-ARMY) Avail: NTIS HC A04/MF A01 CSCL 08/2

Compares the performance of good and poor cognitive mappers on a variety of spatial knowledge acquisition and judgment tasks. Cognitive mapping skill was assessed by measuring subjects' knowledge of a highly overlearned environment, their home community. Subjects categorized as good or poor cognitive mappers participated in a series of experiments that examined learning a novel environment from navigation experience, map learning, map using and map interpretation, spatial judgments based on a memorized map, and navigation in a novel environment based on a memorized map. Good mappers performed more accurately than poor mappers in learning a novel environment, learning maps, and making spatial judgments based on a memorized map. Map using, map interpretation, and navigation tasks did not distinguish good from poor mappers. We conclude that, relative to poor mappers, good cognitive mappers are better able to encode and retain spatial information in memory and to mentally transform or manipulate spatial information in order to make spatial judgements, and we hypothesize that differences in spatial visualization and visual memory abilities may underlie these variations in task performance.
Author (GRA)

N82-16741# RAND Corp., Santa Monica, Calif.
ABILITY DIFFERENCES AND COGNITIVE MAPPING SKILL Interim Report
Perry W. Thorndyke and Sarah E. Goldin Mar. 1981 66 p refs
(Contract MDA903-79-C-0549)
(AD-A106389; RAND/N-1667-Army) Avail: NTIS HC A04/MF A01 CSCL 08/2

Compares good and poor cognitive mappers on a number of individual difference variables potentially related to cognitive mapping skill: spatial abilities, visual/verbal processing style, motivation, and experience. Good and poor mapper groups were given several assessment tests for each of these categories. Comparisons of good and poor mappers' performance on these tests indicated that only spatial abilities reliably distinguished good mappers from poor mappers. Good cognitive mappers showed greater visualization ability, spatial orientation ability, visual memory, and field independence. Other measures showed no between-group differences. It is concluded that spatial ability

is a major determinant of cognitive mapping skill and that spatial ability tests can be used to select personnel for tasks requiring navigation, orientation, and spatial judgment skills. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-16742*# Minnesota Univ., St. Paul. Dept. of Food Science and Nutrition.

STORAGE STABILITY AND IMPROVEMENT OF INTERMEDIATE MOISTURE FOODS, PHASE 5 Final Report, 1 Oct. 1976 - 28 Feb. 1978

Theodore P. Labuza 28 Feb. 1978 399 p refs

(Contract NAS9-12560)

(NASA-CR-167503) Avail: NTIS HC A17/MF A01 CSCL 06H

A method for measuring water binding (a sub w) in gels which was developed and applied to various macromolecular geling agents in order to elucidate their mechanism of water binding was confirmed with concurrent studies using NMR, X-ray diffraction and dye diffusion. The vapor pressure manometric method for a sub w was further refined to give a sub w to + or - 0.0001 units, and a new fiber cup procedure was tested against it. The effectiveness of low a sub w on inhibiting potential toxin production by S. aureus was demonstrated. In addition, ethanol, was shown to be an effective antimicrobial agent at low concentration in lowered a sub w systems. The results of a study of vitamin C loss during processing at high temperature (60-150C) show a change to zero order kinetics due to poor oxygen solubility. Steady state temperature data can be used to predict losses during unsteady state processing. Non-enzymatic browning can be reduced at higher process temperature if residence time decreases. A shelf stable IMF processed cheese food was developed and shown to be acceptable in storage. A.R.H.

N82-16743*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A HYDRODYNAMIC MODEL OF AN OUTER HAIR CELL

Bo O. Jacobson 1982 14 p refs To be presented at the 19th Ann. Northeast Bioengr. Conf., Hanover, New Hampshire, 15-16 Mar. 1982; sponsored by the Thayer School of Engineering Dartmouth Med. School, IEEE, ASME, and the American Society for Engineering Education

(NASA-TM-82773; E-1098) Avail: NTIS HC A02/MF A01 CSCL 06P

On the model it is possible to measure the force and the force direction for each individual hair as a function of the flow direction and velocity. Measurements were made at the man flow velocity .01 m/s, which is equivalent to a flow velocity in the real ear of about 1 micrometer/s. The kinematic viscosity of the liquid used in the model was 10,000 times higher than the viscosity of perilymph to attain hydrodynamic equality. Two different geometries for the sterocilia pattern were tested. First the force distribution for a W-shaped sterocilia pattern was recorded. This is the sterocilia pattern found in all real ears. It is found that the forces acting on the hairs are very regular and perpendicular to the legs of the W when the flow is directed from the outside of the W. When the flow is reversed, the forces are not reversed, but are much more irregular. This can eventually explain the half wave rectification of the nerve signals. As a second experiment, the force distribution for a V-shaped sterocilia pattern was recorded. Here the forces were irregular both when the flow was directed into the V and when it was directed against the edge of the V. T.M.

N82-16744# Lincoln Lab., Mass. Inst. of Tech., Lexington.

THE EFFECTS OF MICROPHONES AND FACEMASKS ON LPC VOCODER PERFORMANCE

Elliot Singer 25 Sep. 1981 26 p refs

(Contract F19628-80-C-0002; AF Proj. 2283)

(AD-A107908; TR-584; ESD-TR-81-277) Avail: NTIS HC A03/MF A01 CSCL 05/8

The effects of oxygen facemasks and noise cancelling microphones on LPC vocoder performance were analyzed and evaluated. Likely sources of potential vocoder performance degradation included the non-ideal frequency response characteristics of the microphone, the acoustic alterations of the speech waveform due to the addition of the facemask cavity, and the presence of breath noise imposed by the close-talking requirement. It is shown that the presence of the facemask produces a vowel-dependent reduction in the bandwidths of the upper speech formants. In addition, the low frequency emphasis normally associated with small enclosures is shown to occur when a pressure microphone is employed for transduction. Noise cancelling microphones, which are sensitive to the pressure gradient, do not exhibit this effect. Finally, an acoustic tube model of the vocal tract and facemask is presented which predicts the absence of spurious resonances within the frequency band of typical narrowband vocoders. Evidence supporting these assertions is presented based on observed vowel spectra. Evaluations performed using Diagnostic Rhyme Tests indicate that the presence of the oxygen facemask and noise cancelling microphone does not result in a significant increase in the LPC vocoder processing loss. Author (GRA)

N82-16745# Bunker-Ramo Corp., Westlake Village, Calif. Electronics Systems Div.

PILOT WORKLOAD: A SURVEY OF OPERATIONAL PROBLEMS Final Technical Report, Apr. 1979 - Sep. 1980

Larry Butterbaugh, Debra Warner, Peter Lovering, and Sam Herron Wright-Patterson AFB AFWAL Aug. 1981 186 p refs

(Contract F33615-78-C-3614; AF Proj. 2403)

(AD-A107758; AFWAL-TR-81-3011) Avail: NTIS HC 09/MF A01 CSCL 01/3

Five hundred and seventy three USAF pilots responded to a survey which had as its objective the identification of operational, crew station design related causes of high pilot workloads. The survey consisted of mailed survey forms and personal interviews structured to conform with the critical incident technique of collecting user-provided data. The survey canvassed over 50 USAF organizations in collecting data for more than 30 currently flown USAF aircraft types. The role control/display design, crew station design, and equipment malfunctions play in contributing to cockpit workload is unique to each aircraft. Other factors, such as weather, flight schedules, and mission phase appear to contribute to cockpit workloads in most all the aircraft surveyed. Further, the reported situations, or critical incidents, indicate that high workloads result from the simultaneous occurrence or existence of several causes. For example, a high workload situation reported for the FB-111 consisted of an equipment failure while flying the low level penetration portion of a mission at night. All data collected has been catalogued for the establishment of an information base, and available for future use in conjunction with aircraft development programs or modernization/retrofit programs.Author (GRA)

N82-16709# Joint Publications Research Service, Arlington, Va.

PHYSIOLOGICAL AND HYGIENIC EVALUATION OF VIBRATION IN THE COCKPIT OF A CARGO HELICOPTER

Yu. G. Matveyev and Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 28-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 22-25 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

N82-16712# Joint Publications Research Service, Arlington, Va.

SIMULATION OF SOME OF MAN'S MOVEMENTS IN DIFFERENT GRAVITY FIELDS

A. V. Zinkovskiy, I. A. Trofimova, and V. A. Chistyakov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 42-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 31-33 (For primary document see N82-16704 07-51)

Avail: NTIS HC A08/MF A01

N82-16717# Joint Publications Research Service, Arlington, Va.
HYGIENIC PRINCIPLES OF ONGOING MONITORING OF QUALITY OF RECYCLED WATER DURING SPACE FLIGHTS
V. M. Skuratov, V. B. Gaydadymov, and S. V. Chizhov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 69-72 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 181 p 48-51 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16718# Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL AND HYGIENIC ASPECTS OF IMPROVING ADDITIONAL PURIFICATION OF WATER RECLAIMED FROM URINE
Z. P. Pak, G. V. Lobacheva, M. M. Spiryayeva, Yu. Ye. Bezumova, T. P. Korotkova, V. P. Petina, and Ye. S. Yevdokimova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 73-78 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 51-54 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16719# Joint Publications Research Service, Arlington, Va.
POSSIBLE USE OF HOUSE FLY LARVAE FOR UTILIZATION OF ORGANIC WASTE IN BIOLOGICAL LIFE-SUPPORT SYSTEMS
Ye. G. Golubeva and T. V. Yerofeyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, v. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 p 79-83 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 54-57 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

N82-16720# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS OF REGENERATION OF CONFINED ATMOSPHERE BY MEANS OF PHOTOSYNTHESIS OF UNICELLULAR ALGAE
G. I. Meleshko, L. M. Krasotchenko, and Ye. K. Lebedeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 6, Nov. - Dec. 1981 (JPRS-79849) 12 Jan. 1982 84-90 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 6, Nov. - Dec. 1981 p 58-62 (For primary document see N82-16704 07-51)
Avail: NTIS HC A08/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-16746*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Aeromechanics Lab.
PRODUCTS OF MULTIPLE FOURIER SERIES WITH APPLICATION TO THE MULTIBLADE TRANSFORMATION
Donald L. Kunz Dec. 1981 20 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis
(NASA-TM-81340; A-8796; USAAVRADCOM-TR-81-A-28) Avail: NTIS HC A02/MF A01 CSCL 12A

A relatively simple and systematic method for forming the products of multiple Fourier series using tensor like operations is demonstrated. This symbolic multiplication can be performed for any arbitrary number of series, and the coefficients of a set of linear differential equations with periodic coefficients from a rotating coordinate system to a nonrotating system is also demonstrated. It is shown that using Fourier operations to perform this transformation make it easily understood, simple to apply, and generally applicable. S.L.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N82-16747* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEMORY-BASED FRAME SYNCHRONIZER Patent
Raymond J. Stattel and James K. Niswander, inventors (to NASA) Issued 3 Nov. 1981 11 p Filed 12 Mar. 1980 Supersedes N80-20453 (18 - 11, p 1405)
(NASA-Case-GSC-12430-1; US-Patent-4,298,987; US-Patent-Appl-SN-129779; US-Patent-CLass-375-106; US-Patent-Class-375-114; US-Patent-Class-375-116; US-Patent-Class-370-100) Avail: US Patent and Trademark Office CSCL 09B

A frame synchronizer for use in digital communications systems wherein data formats can be easily and dynamically changed is described. The use of memory array elements provide increased flexibility in format selection and sync word selection in addition to real time reconfiguration ability. The frame synchronizer comprises a serial-to-parallel converter which converts a serial input data stream to a constantly changing parallel data output. This parallel data output is supplied to programmable sync word recognizers each consisting of a multiplexer and a random access memory (RAM). The multiplexer is connected to both the parallel data output and an address bus which may be connected to a microprocessor or computer for purposes of programming the sync word recognizer. The RAM is used as an associative memory or decorder and is programmed to identify a specific sync word. Additional programmable RAMs are used as counter decoders to define word bit length, frame word length, and paragraph frame length. M.G.

N82-16748*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MODELING AND ANALYSIS OF POWER PROCESSING SYSTEMS (MAPPS). VOLUME 2: APPENDICES Final Technical Report, Oct. 1977 - Aug. 1980
F. C. Lee, S. Radman, R. A. Carter, C. H. Wu, Yuan Yu (TRW Defense and Space Systems Group, Redondo Beach, Calif.), and R. Chang (TRW Defense and Space Systems Group, Redondo Beach, Calif.) Dec. 1980 210 p refs
(Contract NAS3-21051)
(NASA-CR-165539; TRW-32660-6001-RU-01) Avail: NTIS HC A10/MF A01 CSCL 09B

The computer programs and derivations generated in support of the modeling and design optimization program are presented. Programs for the buck regulator, boost regulator, and buck-boost regulator are described. The computer program for the design optimization calculations is presented. Constraints for the boost and buck-boost converter were derived. Derivations of state-space equations and transfer functions are presented. Computer lists for the converters are presented, and the input parameters justified. J.D.H.

N82-16749# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SIMULATION OF A DIGITAL MODEM FOR COMMUNICATING AT 4,800 BITS/S
Mario Mammoli and Eduardo Whitaker Bergamini Jul. 1981 21 p refs In PORTUGUESE
(INPE-2178-RPE/391) Avail: NTIS HC A02/MF A01

A modem with phase modulator and coherent detection is modeled. The validation of the model by simulation in a B-6700 computer using FORTRAN programs is described. Data on the performance of both modulator and demodulator are analyzed. J.D.H.

N82-16750# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
MERGING ON PARALLEL MODELS OF COMPUTATION
John E. Hopcroft and Allan Borodin (Toronto Univ., Ontario) Oct. 1981 19 p refs
(Contract N00014-76-C-0018)
(AD-A106189; CU-CSD-TR-81-472) Avail: NTIS HC A02/MF A01 CSCL 09/2

A variety of models have been proposed for the study of synchronous parallel computation. We review these models and study further some prototype problems. Within a spectrum of shared memory models, we show that loglog n is asymptotically optimal for n processors to merge two sorted lists containing n elements. Author (GRA)

N82-16751# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
TRANSIENT ERROR RELIABILITY MODELS BASED ON DATA ANALYSIS Interim Report
Stephen R. McConnel and Daniel P. Siewiorek Jun. 1981 66 p refs
(ONR Proj. 048-645)
(AD-A106554; CMU-CS-81-128) Avail: NTIS HC A04/MF A01 CSCL 09/2

Experimental data on transient errors from several digital computer systems is presented and analyzed. This is the first large scale public study on the statistical distribution of transient errors. The systems for which data has been collected are the DEC PDP-10 series computers, the CM (trademark) multiprocessor, and the C.vmp fault tolerant microprocessor. Statistical tests indicate that transient errors follow a decreasing hazard rate distribution. This is at variance with the standard assumption of constant hazard rates (exponential distribution) used in reliability modeling, and requires models of greater complexity for accurate results. Models of common fault tolerant redundant structures are developed using the Weibull distribution, which has a time-varying hazard rate. Both analytical and simulation models are used to analyze the differences between the reliabilities predicted by Weibull based transient error models and those predicted by exponential based models. The analysis indicates a significant difference between the models based on the exponential distribution and those based on the decreasing hazard rate Weibull distribution. Reliability differences ranging from -0.10 to +0.20 and factors greater than 2.0 in Mission Time Improvement for Weibull parameters equivalent to measured system behavior are seen in the model results. System designers should be aware of these differences. Author (GRA)

N82-16752# University of South Florida, Tampa. Dept. of Electrical Engineering.
MICROPROCESSOR DIGITAL FAULT Final Report, 13 Mar. - 12 Sep. 1981
H. A. Nienhaus 16 Sep. 1981 47 p refs
(Grant AF-AFOSR-0173-81; AF Proj. 2305)
(AD-A106707; AFOSR-81-0712TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report gives a complete set of fault diagnosis flow diagrams for detecting any fault and isolating any single chip fault in a text generator, which contains a large variety of LS1, MS1, and SS1 ports. The fault diagnosis procedures are designed to minimize test processor diagnosti- time and internal test points. Author (GRA)

N82-16753# South Carolina Univ., Columbia. Dept. of Electrical and Computer Engineering.
MULTIPLE MICROCOMPUTER CONTROL ALGORITHM FEASIBILITY BREADBOARD Final Report, Jun. 1979 - Aug. 1981
R. O. Pettus, M. N. Huhns, L. M. Stephens, and M. J. Trask Aug. 1981 94 p
(Contract N61339-79-C-0096)
(AD-A107940; NAVTRAEQUIPC-79-C-0096-1) Avail: NTIS HC A05/MF A01 CSCL 14/2

The architecture of the breadboard is hierarchially structured and functionally modular. The control algorithm is vested in an efficient applications task manager that is a very compact operating system in each microcomputer, and an optional combination of hardware, firmware, and software. The control algorithm was demonstrated in this breadboard as applicable to real-time simulation of process control in which basic computational tasks do not change in time. T.M.

N82-16754# Delta Information Systems, Inc., Jenkintown, Pa.
USE OF A MICROPROCESSOR TO IMPLEMENT AN ADCCP PROTOCOL WITH REJECT AND SELECTIVE REJECT (FEDERAL STANDARD 1003) Final Report
Aug. 1981 79 p refs
(Contract DCA100-80-C-0221)
(AD-A107769; NCS-TIB-81-7) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report discusses the implementation of the reject and selective reject options of ADCCP (Advanced Data Communications Control Procedures) on an M6800 microprocessor. Flow charts and a portion of the code are included. GRA

N82-16755# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
USE OF EMBEDDED MICROCOMPUTERS IN SYSTEM DEBUGGING AND MAINTENANCE
John Meng and Dan Weaver Feb. 1981 6 p refs Presented at IEEE Conf. Appl. of Mini and Microcomputers, San Francisco, 9-12 Nov. 1981
(Contract W-7405-eng-48)
(DE81-029859; LBL-12313; CONF-811115-2) Avail: NTIS HC A02/MF A01

The microcomputers in systems which use embedded microcomputers to perform control functions can often double as flexible debugging and maintenance devices by switching in high level language read-only memory devices. Systems in which such benefits are successfully exploited are described. DOE

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-16756# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CLASSIC EXAMPLE OF PRODUCER/CONSUMER IMPLEMENTED IN LANAC LANGUAGE
Francisco E. C. Viola and Sergio D. Fischer Jul. 1981 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 33d Reuniao Anual da SBPC, Salvador, 8-15 Jul. 1981
(INPE-2185-RPE/396) Avail: NTIS HC A02/MF A01

The implementation written in LANAC programming language of the classic example of synchronization of parallel processes, the PRODUCER/CONSUMER system, consisting of two concurrent processes which communicate through a shared buffer, is described. The main results obtained in the programming of two versions are also presented. In both implementations, the usefulness of LANAC language is demonstrated. J.M.S.

N82-16757# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A TRANSLATOR FOR THE HIGH LEVEL LANGUAGE SEQUEL 2/QUERY STATEMENT [UM TRADUTOR PARA A LINGUAGEM DE CONSULTA SEQUEL 2/QUERY STATEMENT]
Olga Marie deOliviera, Paulo Cesar Pereira Guerra, Jose Oscar Machado Alexandre, Antonio Luz Furtado, and Flavio Roberto Dias Velasco Jul. 1981 19 p refs In PORTUGUESE; ENGLISH

summary Presented at the 33rd Reuniao Anual da SBPC, 8-15 Jul., 1981, Salvador, Brazil
(INPE-2184-RPE/395) Avail: NTIS HC A02/MF A01

The development and construction of a data interface for a Burroughs B6800 relational data base system, called Sistema Relacional, which has the purpose of simplifying data access are described. The system is supported by the Burroughs DMS-II package, a network oriented system. Information retrieval is accomplished with the high level Sequel 2/Query language. M.G.

N82-16758# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A HIGH LEVEL LANGUAGE FOR DATA ACQUISITION AND PROCESS CONTROL [LANAC - UMA LINGUAGEM DE ALTO NIVEL PARA AQUISICAO DE DADOS E CONTROLE DE PROCESSOS]
Francisco Edwardo deCarvalhoviola, Sergio Donizetti Fischer, and Celso deRennae Souza Jul. 1981 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Congr. da Soc. Braseleira de Computacao (VIII SEMISH) Florianopolis, Brazil, 27-31 Jul. 1981
(INPE-2173-RPE/389) Avail: NTIS HC A02/MF A01

An ALGOL like language, LANAC, with statements in Portuguese, without recursion, is described. It was developed at INPE/CNPq for minicomputers applied in real time systems; so it has available SEMAPORES for concurrent process synchronization. The LANAC compiler was written in B6800 EXTENDED ALGOL, producing assemly code, in its first version, for the Hewlett-Packard 2116B minicomputer. The usefulness of the LANAC language for real time systems programming was verified. Code generators for other minicomputers are implemented and more powerful data and control structures are introduced into the language. S.L.

N82-16759# Radio Technical Commission for Aeronautics, Washington, D. C.
SOFTWARE CONSIDERATIONS IN AIRBORNE SYSTEMS AND EQUIPMENT CERTIFICATION
18 Nov. 1981 67 p refs
(RTCA/DO-178) Avail: NTIS HC A04/MF A01 CSCL 09B

A disciplined approach to avionics software design, development, testing, configuration management, and documentation is presented. Guidance is provided for different levels of criticality of the functions for which the software is designed. The need for software modification by manufacturers and users is considered, together with its impact on pre- and post-certification configuration management and documents. Methods alternative to the techniques recommended here may be used if equivalence is shown. A glossary of terms is provided. J.D.H.

N82-16760*# Science Applications, Inc., Huntsville, Ala.
REEDS COMPUTER CODE Final Report
Charles Bjork 23 Dec. 1981 219 p
(Contract NAS8-31806)
(NASA-CR-161956; SAI-82-738-HU) Avail: NTIS HC A10/MF A01 CSCL 09B

The REEDS (rocket exhaust effluent diffusion single layer) computer code is used for the estimation of certain rocket exhaust effluent concentrations and dosages and their distributions near the Earth's surface following a rocket launch event. Output from REEDS is used in producing near real time air quality and environmental assessments of the effects of certain potentially harmful effluents, namely HCl, Al2O3, CO, and NO. S.L.

N82-16761# Rose-Hulman Inst. of Tech., Terre Haute, Ind.
DOCUMENTATION FOR PROGRAM SIMICE Final Report
Warren W. Bowden 23 Mar. 1981 44 p refs
(Grant AF-AFOSR-0180-80; AF Proj. 2308)
(AD-A106777; AFOSR-81-0616TR) Avail: NTIS HC A03/MF A01 CSCL 14/2

A computer code (SIMICE) has been developed to assist in establishing correct test conditions and in extrapolating icing test data to full scale. The code calculates the conditions under which a model should be tested to maintain similitude between it and a prototype. In particular the matched quantities are the collection efficiency, heat transfer flux, and the flux of liquid water approaching the body under test. The SIMICE code structure and operation are described and a listing of the code provided. Author (GRA)

N82-16762# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ANAPHORA FOR LIMITED DOMAIN SYSTEMS
Philip J. Hayes 30 Jul. 1981 17 p refs Submitted for publication
(Contract F33615-78-C-1551; ARPA Order 3597)
(AD-A106559; CMU-CS-81-136) Avail: NTIS HC A02/MF A01 CSCL 05/8

This paper presents a simple mechanism for the resolution of anaphora in limited domain natural language systems. This mechanism provides functionality equivalent to the natural communication mechanism of anaphora as used and understood by people, but without the deep inferencing or cognitive modelling required for full simulation of human performance. The mechanism covers simple pronoun anaphora, and set selection anaphora (e.g., 'last one', 'one before', 'others'). It was developed to provide the most efficient and effective communication between system and user, even if this meant diverging significantly from human performance when this performance was impractical to reproduce. In cases of radical divergence, we were careful to make the behavior of the mechanism very simple and easy to predict. In this way, the user can either rely on his experience of human performance or his knowledge of the artificial, but simple, substitute to predict the behaviour of the system in response to his inputs, and thus construct his inputs to use the mechanism to best advantage. An algorithmic description of an implemented version of the mechanism is presented. A similar approach to other aspects of man-machine interfaces is recommended as a promising way to address the problem of habitability that still plagues all natural language computer interfaces. Author (GRA)

N82-16763# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
OPS5 USER'S MANUAL
Charles L. Forgy Jul. 1981 57 p refs
(Contract F33615-78-C-1551; ARPA Order 3597)
(AD-A106558; CMU-CS-81-135) Avail: NTIS HC A04/MF A01 CSCL 09/2

This is a combination introductory and reference manual for OPS5, a programming language for production systems. OPS5 is used primarily for applications in the areas of artificial intelligence, cognitive psychology, and expert systems. OPS5 interpreters have been implemented in LISP and BLISS. Author (GRA)

N82-16764# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
WRITING EFFICIENT CODE Interim Report
Jon Louis Bentley 27 Apr. 1981 72 p refs
(AD-A106553; CMU-CS-81-116) Copyright. Avail: Issuing Activity CSCL 09/2

The most important step in making a software system efficient is the proper selection of data structures and algorithms; many papers and textbooks have been devoted to these topics. Most discussions, however, neglect another important activity: that of writing machine-independent efficient code. This paper examines a set of techniques for accomplishing that step. We examine those techniques both in an abstract setting and in their application of a real program, where they led to a speedup of a factor of over six. Because these techniques should be employed rarely, an important part of this paper is describing exactly when one should (and should not) use them. Author (GRA)

N82-16765# Stanford Univ., Calif. Dept. of Computer Science.
TOWARD A UNIFIED LOGICAL BASIS FOR PROGRAMMING LANGUAGES
Chih-sung Tang Jun. 1981 22 p refs
(Contract N00014-76-C-0687; Grant AF-AFOSR-0014-81)
(AD-A106772; SU-STAN-CS-81-865) Avail: NTIS HC A02/MF A01 CSCL 09/2

In recent years, more and more computer scientists have been paying attention to temporal logic, since there are many properties of programs that can be described only be bringing the time parameter into consideration. But existing temporal

logic languages, such as Lucid, in spite of their mathematical elegance, are still far from practical. I believe that a practical temporal-logic language, once it came into being, would have a wide spectrum of applications. XYZ/E is a temporal-logic language. Like other logic languages, it is a logic system as well as a programming language. But unlike them, it can express all conventional data structures and control structures, nondeterminate or concurrent programs, even programs with branching-time order. We find that the difficulties met in other logic languages often stem from the fact that they try to deal with these structures in a higher level. XYZ/E adopts another approach. We divide the language into two forms: the internal form and the external form. The former is lower level, while the latter is higher. Just as any logic system contains rules of abbreviation, so also in XYZ/E there are rules of abbreviation to transform the internal form into the external form, and vice versa. These two forms can be considered to be different representations of the same thing. We find that this approach can ameliorate many problems of formalization. Not only does XYZ/E have various practical applications, it also has a theoretical impact. GRA

N82-16766# Maryland Univ., College Park. Computer Vision Lab.

THREE-DIMENSIONAL DIGITAL LINE SEGMENTS

Chul E. Kim Aug. 1981 21 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A106813; TR-1087; AFOSR-81-0707TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Digital arcs in 3D digital pictures are defined. The digital image of an arc is also defined. A digital arc is defined to be a digital line segment if it is the digital image of a line segment. It is shown that a digital line segment may be characterized by the chord property holding for its projections onto the coordinate planes. It is also shown that a digital line segment may not be characterized by its own chord property. A linear time algorithm is presented that determines whether or not a digital arc is a digital line segment. Author (GRA)

N82-16767# Control Data Corp., Rockville, Md.

QUSER USER'S GUIDE

Mark D. Buck Sep. 1981 77 p refs
(Contract DE-AC01-80EI-11975)
(DE81-030681; DOE/EIA-11975/T1) Avail: NTIS HC A05/MF A01

The QUSER program functions as the controlling routine of the Midterm Energy Market Model (MEMM). In MEMM, a linear program (LP) is solved iteratively until QUSER determines that all convergence criteria have been met. After each iteration, QUSER is called to calculate new input prices and demands for the next iteration of the LP. The LP solution is considered to be a converged solution when the prices and demands input to the last iteration and the prices and demands from the LP solution differ by less than two percent. QUSER's other main function is to model energy pricing regulations for natural gas and electricity. These policies are based on average prices while the LP solution gives marginal prices. The program uses FORTRAN language. DOE

N82-16768# National Bureau of Standards, Washington, D.C. Center for Manufacturing Engineering.

A TECHNICAL BRIEFING ON THE INITIAL GRAPHICS EXCHANGE SPECIFICATION (IGES) Progress Report, Jan. 1980 - Jun. 1981

J. C. Kelly (Sandia Labs.), Robert Wolf (Xerox Corp.), Philip Kennicott (General Electric), Roger N. Nagel (International Harvester), and Joan Wellington, ed. Jul. 1981 136 p refs
(PB81-238719; NBSIR-81-2297) Avail: NTIS HC A07/MF A01 CSCL 13H

The Initial Graphics Exchange Specification, a communication file structure for data produced on and used by computer-aided design and computer-aided manufacturing systems is described. The structure provides a common basis for the automatic interchange of data between these systems, for the transfer of data to and from external application programs, and archiving. M.G.

N82-16105*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE DSN PROGRAMMING SYSTEM

G. A. Madrid *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 19-23 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09B

N82-16121*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IMPLICATIONS OF THE PUTNAM SOFTWARE EQUATION ON CONFIDENCE LEVELS FOR PROJECT SUCCESS

R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 172-185 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09B

N82-16126*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NEW S-BAND TRANSMITTER AUTOMATION SOFTWARE

W. Stahnke *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 214-218 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 09B

N82-17049*# North Georgia Coll., Dahlonega. Dept. of Physics.

DEVELOPMENT OF PHOTOMULTIPLIER ELECTRONICS AND COMPUTER INTERFACING SOFTWARE FOR A HIGH SPEED PHOTOELECTRIC PHOTOMETER-STOKE'S METER

Terry R. Flesch *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09B

N82-17069*# Alabama Univ., University. Dept. of Mathematics.

DIGITAL COMPENSATION TECHNIQUES FOR THE EFFECTS OF TIME LAG IN CLOSED-LOOP SIMULATION USING THE 6 DOF MOTION SYSTEM

Richard Brown *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 30 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N82-16769# University of Southern California, Los Angeles. Dept. of Computer Science.

THREE PAPERS OF NETWORK PROGRAMS

Per Brinch Hansen Sep. 1981 86 p refs
(Contract N00014-77-C-0714; NR Proj. 048-647)
(AD-A106799) Copyright. Avail: Issuing Activity CSCL 09/2

This report contains three papers on distributed computing entitled: Basic concepts of network programs, Language notation for network programs, and Proof rules for network programs. Together these papers outline a systematic method for the programming of computer networks. Author (GRA)

N82-16770# Los Alamos Scientific Lab., N. Mex. Computing Div.

LONG-RANGE PREDICTION OF NETWORK TRAFFIC

William Alexander and Richard Brice 1981 9 p refs Presented at the Computer Performance Evaluation Users Group Meeting, San Antonio, 16 Nov. 1981
(Contract W-7405-eng-36)
(DE81-030241; LA-UR-81-2587; CONF-811118-1) Avail: NTIS HC A02/MF A01

A method of making long range computer system workload predictions is presented. The method quantifies the effect of qualitative changes in computing by identifying assumptions and by considering the effect of a change on individual users. The method is illustrated by an example involving message traffic in a large computer network. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-16771# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

THE HEURISTIC OF GEORGE POLYA AND ITS RELATION TO ARTIFICIAL INTELLIGENCE

Allen Newell Jul. 1981 56 p refs Presented at Intern. Symp. on the Methods of Heuristic, Bern, 15-18 Sep. 1980 Submitted for publication

(Contract F33615-78-C-1551; ARPA Order 3697)

(AD-A106557; CMU-CS-81-133) Avail: NTIS HC A04/MF A01 CSCL 09/2

Polya's fundamental work in heuristic is well known and well regarded in artificial intelligence. However, no one has built seriously on his work, e.g., by constructing programs that make use of his heuristic. This paper attempts to understand why this might be the case. First, an attempt is made to characterize the nature of Polya's heuristic. Then six theses are put forward that might account for the failure of his work to have a major impact. Three are easily discarded, but three are serious candidates: that the essential heuristic knowledge is not captured in Polya's work; that the emphasis on learning in Polya's heuristic is beyond the current art in artificial intelligence; and that the use of auxiliary problems is beyond the current art. This last thesis is explored in detail in the remainder of the paper. Some interesting concepts emerge, particularly the notion of object-centered problem space and the contrast between tame and wild subproblems. Author (GRA)

N82-16772# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

THE KNOWLEDGE LEVEL

Allen Newell Jul. 1981 51 p refs Presented at Am. Assoc. for Artificial Intelligence, Stanford, Calif. Submitted for publication

(Contract F33615-78-C-1551; ARPA Order 3597)

(AD-A106556; CMU-CS-81-131) Avail: NTIS HC A04/MF A01 CSCL 09/2

This paper focuses on a basic substantive problem: the nature of knowledge and representation. There are ample indications that artificial intelligence is in need of substantial work in this area. The paper proposes a theory of the nature of knowledge, namely, that there is another computer system level immediately above the symbol (or program) level. The nature of computer system levels is reviewed, the new level proposed, and its definition is treated in detail. Knowledge itself is the processing medium at this level and the principle of rationality plays a central role. Some consequences of the existence of the knowledge level and some relations to other fields are discussed. GRA

N82-16773# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

THE K-D-B-TREE: A SEARCH STRUCTURE FOR LARGE MULTIDIMENSIONAL DYNAMIC INDEXES Interim Report

John T. Robinson Feb. 1981 24 p refs

(Contract N00014-76-C-0370; Grant NSF MCS-78-23676)

(AD-A106550; CMU-CS-81-106) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of retrieving multikey records via range queries from a large, dynamic index is considered. By 'large' it is meant that most of the index must be stored on secondary memory. By 'dynamic' it is meant that insertions and deletions are intermixed with queries, so that the index cannot be built beforehand. A new data structure, the K-D-B-tree, is presented as a solution to this problem. K-D-B-trees combine properties of K-D-trees and B-trees. It is expected that the multidimensional search efficiency of balanced K-D-trees and the I/O efficiency of B-trees should both be approximated in the K-D-B-tree. Preliminary experimental results that tend to support this are reported. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-16774# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NON-LINEAR REGRESSION MODELS: A STUDY OF THE PRINCIPAL ESTIMATION METHODS

Luiz Antonio Nogueira Lorena Jul. 1981 20 p refs In PORTUGUESE; ENGLISH summary Presented at the 13th Coloquio de Mat., Pocos de Caldas, 12-24 Jul. 1981

(INPE-2183-RPE/394) Avail: NTIS HC A02/MF A01

A study of the main methods used for parameter estimation in nonlinear regression models is studied. The classical methods of Gauss-Newton, gradient, and Marquardt are presented, with their power and limitations discussed, and suggestions for computer implementation are given. The approach that uses the solution of the normal equations, where the coefficient matrix appear in the 'correlation' matrix form, is presented, using the Cholesky decomposition. Modern implementations, using orthogonal decompositions, are referenced as alternative to the use of normal equations. Finally, alternative methods to the linearization are presented, as well as study of the conditioning problem for the normal equations. S.L.

N82-16775# Yale Univ., New Haven, Conn. Dept. of Computer Science.

SPARSE MATRICES Final Report, 1 Jan. 1977 - 31 Dec. 1980

Martin H. Schultz Aug. 1981 8 p refs

(Contract F49620-77-C-0037; AF Proj. 2304)

(AD-A105187; AFOSR-81-0656TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The investigators associated with this contract produced 17 documents on the broad area of sparse matrices. They recorded research on algorithmic and software development of direct sparse linear equation solvers. Also, the examination of problems involving sparse matrices that arise in the numerical solution of partial differential equations is included. The development of the Yale Sparse Matrix Package, a computer software package to efficiently solve directly large sparse systems, is indeed one of the highlights of this research. It has been independently tested and found exceptional in solving symmetric problems.

Author (GRA)

N82-16776# Texas Univ. at Arlington. Center for Cybernetic Studies.

NONPOLYNOMIAL AND INVERSE INTERPOLATION FOR LINE SEARCH: SYNTHESIS AND CONVERGENCE RATES

J. Barzilai and A. Ben-Tal (Technion - Israel Inst. of Technology) Jul. 1981 37 p refs

(Contracts N00014-75-C-0569; N00014-80-C-0242)

(AD-A106680; CCS-RR-409) Avail: NTIS HC A03/MF A01 CSCL 12/1

The rate of convergence of line search algorithms based on general interpolating functions is derived, and is shown to be independent of the particular interpolating function used. This result holds for the root finding problem $f(x) = 0$ as well. We show how inverse interpolation can be used in conjunction with the line search problem, and derive its rate of convergence. Our analysis suggests that one-point line search algorithms (in particular Newton's method) are inefficient in a sense. Two-point algorithms using rational interpolating functions are recommended. Author (GRA)

N82-16777# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE H-FUNCTION AND PROBABILITY DENSITY FUNCTIONS OF CERTAIN ALGEBRAIC COMBINATIONS OF INDEPENDENT RANDOM VARIABLES WITH H-FUNCTION PROBABILITY DISTRIBUTION Ph.D. Thesis

Ivy Dewey Cook, Jr. May 1981 243 p refs

(AD-A106768; AFIT-CI-81-47D) Avail: NTIS HC A11/MF A01 CSCL 12/1

A practical technique is presented for determining the exact probability density function and cumulative distribution function

of a sum of any number of terms involving any combination of products, quotients, and powers of independent random variables with H-function distributions. The H-function is the most general named function, encompassing as special cases most of the other special functions of mathematics and many of the classical statistical distributions. Its unique properties make it a powerful tool for statistical analysis. In particular, the product, quotient, and powers of independent H-function variates are also H-function variates, and the Laplace and Fourier transforms and the derivatives of an H-function are readily-determined H-functions. This dissertation provides background material, including history on H-functions and the algebra of random variables and definition, properties and special cases of the H-function. For determining whether convergence of a general Mellin-Barnes integral or an H-function occurs with left-half-plane versus right-half-plane summation of residues, evaluation guidelines are formally established and applied to the known special cases, the Laplace transform, and the derivatives of the H-function. Then, a new, improved formulation for evaluation of an H-function by summing residues is derived. GRA

N82-16778# California Univ., Riverside. Dept. of Mathematics.

DOMINATION PROBLEM FOR VECTOR MEASURES AND APPLICATIONS TO NONSTATIONARY PROCESSES

M. M. Rao 23 Sep. 1981 22 p refs
(Contract N00014-79-C-0754)
(AD-A106375; TR-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper the question of finite p-variation and its representation (via the Radon-Nikodym theory) will not be considered beyond its comparison, even though it is useful in the integ_l representation of certain linear operations. On the other hand, the problem of finite p-semi-variation has immediate interest for certain stochastic process representations, and that will be treated in a reasonably detailed fashion for a class of vector measures. GRA

N82-16779# Harvard Univ., Cambridge, Mass. Dept. of Statistics.

DENSITY ESTIMATION AND PROJECTION PURSUIT METHODS

Peter J. Huber Sep. 1981 16 p refs
(Contract N00014-79-C-0512; Grant NSF MCS-79-08685)
(AD-A107816; PJH-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

Recently, it has been proposed to use projection pursuit methods for multidimensional density estimation. This report discusses conceptual and technical issues in density estimation and describes several variant approaches to projection pursuit density approximation and estimation. A new measure of fit between multivariate densities is introduced (maximum marginal relative entropy), and some of its properties are derived; it seems to be particularly well adapted to projection pursuit density approximation. GRA

N82-16780# Texas Technological Univ., Lubbock. Dept. of Mathematics.

LIE GROUPS AND LIE ALGEBRAS IN VIDEO TRACKING Final Report, 1 Mar. 1980 - 28 Feb. 1981

Thomas G. Newman 26 Oct. 1981 58 p refs
(Contract DAAG29-80-C-0087)
(AD-A107858; ARO-17219.1-R-EL) Avail: NTIS HC A04/MF A01 CSCL 12/1

When a three-dimensional dynamic scene is projected to a two-dimensional image plane, a complex class of motions are observed, which may be approximated by translation and linear transformation. In this report, we show how such motion may be resolved into principal components and measured from 2 dimensional data. Lie theoretic techniques are used to obtain a motion model, and to incorporate generalized velocity measurements in a closed loop feedback tracker. Stability of numerical calculations is enhanced by a method based on an application of Stoke's Theorem to certain differential 2-forms. Author (GRA)

N82-16781# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Economics.

TESTING FOR GAUSSIANITY AND LINEARITY OF STATIONARY TIME SERIES

Melvin J. Hinich Oct. 1981 12 p refs
(Contract N00014-75-C-9494)
(AD-A017548; TR-23) Avail: NTIS HC A02/MF A01 CSCL 12/1

Stable autoregressive (AR) and autoregressive moving average (ARMA) processes belong to the class of stationary linear time series. A linear time series is Gaussian if the distribution of the independent innovations (sigma (t)) is normal. Assuming that E sigma (t) = 0, some of the third order cumulants sub C XXX (m,n) = Ex(t)X(t+n) will be non-zero if the sigma (t) are not normal and E sigma cube(t)=0. If the relationship between X(t) and sigma (t) is non-linear, then (X(t)) is non-Gaussian even if the sigma (t) are normal. This paper presents a simple estimator of the bispectrum, the Fourier transform of of (sub C XXX (m,n)). This sample bispectrum is used to construct a statistic to test whether the bispectrum of (x(t)) is non-zero. A rejection of the null hypothesis implies a rejection of the hypothesis that (x(t)) is Gaussian. A related test statistic is then presented for testing the hypothesis that (x(t)) is linear. The asymptotic proprties of the sample bispectrum are incoroprated in these test statistics. The tests are consistent as the sample size (N approaches infinity). GRA

N82-16782# Wayne State Univ., Detroit, Mich.

APPLICATIONS OF RANDOM DIFFERENTIAL EQUATIONS TO ENGINEERING SCIENCE. WAVE PROPAGATION IN TURBULENT MEDIA AND RANDOM LINEAR HYPERBOLIC SYSTEMS Final Report, 1 Mar. 1975 - 31 Aug. 1981

Pao-Liu Chow 10 Nov. 1981 7 p refs
(Grants DAHC04-75-G-0091; DAAG29-76-G-0141; DAAG29-78-G-0042)
(AD-A108020; ARO-12360.11-M; ARO-15452.8-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research has been conducted in two major problem areas: Applications of Random Differential Equations to Engineering Science. Wave Propagation in Turbulent Media and Random Linear Hyperbolic Systems. These two area are not disjoint. In fact the second problem area is a follow-up study on problems in the first one with emphasis on wave propagation in turbulent media. We have investigated several turbulence-related problems arising from engineering science. They include problems in wave propagation through turbulent media, turbulent transport theory, the surface roughness effect on hydrodynamic lubrication and wave scattering, and stability of elastic structures under random loading or with imperfections. In the theoretical aspect, the research is mainly concerned with the development of new methodology in solving differential equations with random coefficients, examination of the existing closure approximations with regards to their validity and possible improvements. Certain related mathematical questions are also studied. GRA

N82-16783# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.

GENERATION OF ORTHOGONAL BOUNDARY FITTED COORDINATE SYSTEMS Final Report

Henry J. Haussling and Roderick M. Coleman Nov. 1981 37 p refs
(AD-A107851; DTNSRDC-81/079) Avail: NTIS HC A03/MF A01 CSCL 12/1

Various methods for numerically generating orthogonal boundary-fitted coordinate systems are discussed. Simple generating equations are used with coordinate distributions specified on all of the boundaries. Iterative determination of orthogonalizing source terms for Poisson generating system yields better results and is applied successfully to several geometries. GRA

N82-16784# California Univ., Livermore. Lawrence Livermore Lab.

INCOMPLETE BLOCK CYCLIC REDUCTION

Garry Rodrigue and Donald Wolitzer (Wellesley College) 17 Apr. 1981 18 p refs Presented at the 2nd IMACS Intern. Symp. on Parallel Computation, Newark, Del., 9-11 Nov. 1981
(Contract W-7405-eng-48)
(UCRL-85837; CONF-811102-1) Avail: NTIS HC A02/MF A01

An incomplete factorization using odd even shuffles is

developed and compared to other methods on the CRAY-1. Multiprocessor considerations for these algorithms are discussed. DOE

N82-16785# Sandia Labs., Albuquerque, N. Mex.
TRANSIENT MAGNETIC-FIELD CALCULATIONS WITH TRIDIF
Marion L. Hodgdon and John R. Freeman 1981 10 p refs Presented at the COMPUMAG Conf., Argonne, Ill., 14 Sep. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030843; SAND-81-2001C; CONF-810954-1) Avail: NTIS HC A02/MF A01

TRIDIF is a time dependent diffusion version of the well known PANDIRA-POISSON-TRIM triangular mesh magnet code. Modifications which allow TRIDIF to treat field diffusion in materials with time varying permeabilities are described. A heuristic dipole alignment model which describes major and minor hysteresis loops and frequency dependence was included to provide the requisite permeabilities. Good agreement between the measured and computed magnetic fields was found for a simple test experiment. DOE

N82-17077*# Alabama A & M Univ., Huntsville. Dept. of Mathematics.
AN INVESTIGATION OF THE UNIFORM RANDOM NUMBER GENERATOR
Enoch C. Temple *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-16786# California Univ., Berkeley. Operations Research Center.
STATISTICAL DATA ANALYSIS FOR RELIABILITY TESTS Final Report, 1 Feb. 1980 - 31 Jan. 1981
Richard E. Barlow 31 Jan. 1981 10 p refs
(Grant AF-AFOSR-3179-77)
(AD-A105188; AFOSR-81-0657TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper gives a brief abstract of statistical analysis research ongoing at the Air Force Office of Scientific Research. GRA

N82-16787# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
SYSTOLIC ALGORITHMS FOR RUNNING ORDER STATISTICS IN SIGNAL AND IMAGE PROCESSING
Allan L. Fisher Jul. 1981 18 p refs
(Contracts N00014-76-C-0370; N00014-80-C-0236; F33615-78-C-1551; Grant NSF MCS-78-23676)
(AD-A106555; CMU-CS-81-130) Avail: NTIS HC A02/MF A01 CSCL 12/1

Median smoothing, a filtering technique with wide application in digital signal and image processing, involves replacing each sample in a grid with the median of the samples within some local neighborhood. As implemented on conventional computers, this operation is extremely expensive in both computation and communication resources. This paper defines the running order statistics (ROS) problem, a generalization of median smoothing. It then summarizes some of the issues involved in the design of special purpose devices implemented with very large scale integration (VLSI) technology. Finally, it presents algorithms designed for VLSI implementation which solve the ROS problem and are efficient with respect to hardware resources, computation time, and communication bandwidth. Author (GRA)

N82-16788# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
ARMA SPECTRAL ESTIMATION: AN EFFICIENT CLOSED FORM PROCEDURE Final Report
James A. Cadzow Aug. 1981 13 p refs
(Grant AF-AFOSR-0069-80; AF Proj. 2305)
(AD-A106753; AFOSR-81-0727TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this report, an effective procedure for effecting on ARMA spectral model of a time series is described. This procedure is predicated on minimizing as set of 'basic error' terms as generated from an ARMA model that is hypothesized as characterizing the time series under analysis. The spectral estimation performance achieved in using this approach has been empirically found to be generally superior to that obtained using such contemporary methods as maximum entropy and the periodogram. Author (GRA)

N82-16789# Maryland Univ., College Park. Computer Vision Lab.
TEXTURE CLASSIFICATION WITH CHANGE POINT STATISTICS
Stanley M. Dunn Jul. 1981 19 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A106814; TR-1082; AFOSR-81-0708TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Although the problem of texture classification has been thoroughly studied, it is still desirable to investigate whether or not we can model the random behavior of the imaging equipment and still achieve a reliable classification scheme. To this end, we introduce a statistical test previously used to determine whether or not a sequence of random variables has a change point. GRA

N82-16790# Naval Postgraduate School, Monterey, Calif.
QUANTILE ESTIMATION IN DEPENDENT SEQUENCES
P. Heidelberger (IBM Research Center, Yorktown Heights, N.Y.) and P. A. W. Lewis Sep. 1981 57 p refs
(RR140501)
(AD-A106132; NPS55-81-015) Avail: NTIS HC A04 A01 CSCL 12/1

Standard nonparametric estimators of quantiles based on order statistics can be used not only when the data are i.i.d., but also when the data are from a stationary, phi-mixing process of continuous random variables. However, when the random variables are highly positively correlated, sample sizes needed for acceptable precision in estimates of extreme quantiles are computationally unmanageable. A practical scheme is given, based on a maximum transformation in a two-way layout of the data, which reduces the sample size sufficiently to allow an experimenter to obtain a point estimate of an extreme quantile. Three schemes are then given which lead to confidence interval estimates for the quantile. One uses a spectral analysis of the reduced sample. The other two, averaged group quantiles and nested group quantiles, are extensions of the method of batched means to quantile estimation. None of the schemes requires that the process being simulated is regenerative. Author (GRA)

N82-16791# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
THE DESIGN OF MULTIACTIVITY MULTIFACILITY SYSTEMS
Richard M. Soland 15 Jun. 1981 32 p refs
(Contract N00014-75-C-0729; Grant NSF ECS-79-11909; NR Proj. 347-020)
(AD-A107670; SERIAL-T-444) Avail: NTIS HC A03/MF A01 CSCL 12/1

We consider a service/distribution system in which each of N activities is to be carried out at one or several facility locations according to one of a specified set of configurations; each configuration is a specific subset of the set of L facilities being considered, along with a specific strategy for their use. We call such a system a multiactivity multifacility system and present a mathematical formulation for its optimal design that includes capacity restrictions at the facilities and the treatment of multiple criteria. The design problem is simply to choose an appropriate configuration for each of the N activities. We discuss various criteria and we show that the multiactivity multifacility design problem includes many familiar discrete location problems as special cases. We introduce a 0-1 linear optimization model called the team generalized assignment problem (T-GAP) and show that parametric solution of a T-GAP will yield all efficient solutions of the multiactivity multifacility design problem with

multiple criteria. Rather than attempting to find all efficient solutions, however, we advocate an interactive approach and describe an interactive branch-and-bound algorithm that solves the design problem as a finite sequence of T-GAPs. We also discuss efficient ways to solve T-GAPs. Author (GRA)

N82-16792# Analytic Sciences Corp., Reading, Mass.
RESEARCH IN MULTIRATE ESTIMATION AND CONTROL OPTIMAL SAMPLE RATE SELECTION Progress Report, 1 May 1980 - 20 Apr. 1981
Douglas P. Glasson and Jeffery Dowd 8 Oct. 1981 68 p refs
(Contract N00014-79-C-0431)
(AD-A108043; TASC-TR-1356-2) Avail: NTIS HC A04/MF A01 CSCL 01/3

A new algorithmic methodology for sample rate selection in multirate digital control design is developed. The methodology is based on optimizing the random disturbance rejection properties of a closed-loop multirate control structure under a computational constraint. The formulation and mathematical development of the multirate control design and sample rate selection procedure are presented; the sample rate selection technique and properties of the resulting controllers are demonstrated through aircraft control examples. GRA

N82-16793# Los Alamos Scientific Lab., N. Mex.
REGIONAL MONTE CARLO SOLUTION OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS
Thomas E. Booth 1981 8 p refs Presented at the ANS Winter Meeting, San Francisco, 29 Nov. 1981
(Contract W-7405-eng-36)
(DE81-028772; LA-UR-81-2138; CONF-811103-19) Avail: NTIS HC A02/MF A01

A continuous random walk procedure for solving some elliptic partial differential equations at a single point is generalized to estimate the solution everywhere. The Monte Carlo method described is exact (except at the boundary) in the sense that the only error is the statistical sampling error that tends to zero as the sample size increases. A method to estimate the error introduced at the boundary is provided so that the boundary error can always be made less than the statistical error. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-16794# RAND Corp., Santa Monica, Calif.
CONFLICT AMONG TESTING PROCEDURES IN A LINEAR REGRESSION MODEL
Daniel F. Kohler Oct. 1981 16 p refs
(RAND/P-6691) Avail: NTIS HC A02/MF A01

It is shown that for finite but large samples an inequality relation exists between the powers of the likelihood ratio test statistic, the Wald test statistic, and the Lagrange multiplier test statistic. The Wald test is uniformly more powerful than either of the other two tests, and the likelihood ratio test is more powerful than the Lagrange multiplier test for very large samples and for moderate to large differences between the null hypothesis and the true value of the tested parameters. The assumption of a scalar covariance matrix is made to simplify the exposition. The results can probably be generalized to hold for any disturbance vector which allow maximum likelihood estimation. M.G.

N82-16795# RAND Corp., Santa Monica, Calif.
MODELS IN THE POLICY PROCESS: PAST, PRESENT, AND FUTURE
Warren E. Walker Sep. 1981 30 p refs Presented at the Tenth IFIP Conf. on System Modeling and Optimization, New York, 31 Aug. - 4 Sep. 1981
(RAND/P-6654) Avail: NTIS HC A03/MF A01

The utilization and usefulness of computer models in policy making, primarily in the public sector, is reviewed. Increasing involvement of the policy analyst in policy implementation is shown, as is the flexibility and practicality of interlocking small models as opposed to a single large model. Reasons for predicting an increased use of computer modeling in government planning are presented. J.D.H.

N82-16796# North Carolina State Univ., Raleigh. Operations Research.
RANDOM NETWORK GENERATION
Bajis M. Dodin and Zaid M. Naman Jun. 1981 15 p
(Contract DAAG29-79-C-0211; Grant NSF ENG-78-17936)
(AD-A106360; NCSU-OR-179; ARO-16352.11-M) Avail: NTIS HC A02/MF A01 CSCL 12/2

This report is a documentation of the computer program that generates a network with specified numbers of nodes and arcs. It gives the logic of the program, a flowchart representation, and a printout of the program instructions (upon request). Also it gives an example. The program is written in FORTRAN.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-16797# Messina Univ. (Italy). 1st. de Struttura della Materia.
MULTIPLE ELECTROMAGNETIC SCATTERING FROM A CLUSTER OF SPHERES. VOLUME 2: SYMMETRIZATION Special Publication, Sep. 1980 - Mar. 1981
O. I. Sindoni (Army Armanent Research and Development Command, Aberdeen Proving Ground, Md.), F. Borghese, P. Denti, and G. Toscano Sep. 1981 19 p refs
(Grant DE-ERO-78-G-106)
(AD-A106658; AD-E410444; ARCSL-SP-81009) Avail: NTIS HC A02/MF A01 CSCL 20/3

Group theory is used to put the system of equations for the expansion of coefficients of the electromagnetic field scattered by a cluster of spheres in factorized form. GRA

N82-16798# Wisconsin Univ., Madison. Dept. of Physics.
[OPTICALLY PUMPED POLARIZED ION SOURCES] Technical Progress Report, 1 Feb. - 30 May 1981
Jul. 1981 27 p refs
(Contract DE-AC02-81ER-40001)
(DE81-026306; DOE/ER-40001/1) Avail: NTIS HC A03/MF A01

Progress on the development of optically pumped polarized ion sources is reported. The production of polarized Li(+) or Na(+) ions is based on the production of Li or Na atoms by an atomic oven, polarization of the Li or Na atoms by optical pumping, ionization on a heated oxidized tungsten surface to form Li(+) or Na(+) ions, and converted to polarized Li(-) or Na(-) ions in a potassium or cesium vapor cell. The conversion of (3)He(+) ions into polarized (3)He(-) ions will be accomplished by the pickup in a low magnetic field of two electrons in two separate collisions in an optically pumped electron spin polarized Na vapor target. Polarized H(-) ions are produced by using an optically pumped electron spin polarized Na vapor target in a large magnetic field to partially convert H(+) ions into electron spin polarized HO atoms. The electron spin polarization is transferred to the proton by a Sona diabatic transition. The fast nuclear polarized HO atoms are then partially converted to polarized H(-) ions in a second unpolarized alkali vapor target. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-16799 Catholic Univ. of America, Washington, D.C.
HIGH FREQUENCY SCATTERING BY A SPHERE WITH COMPLEX SURFACE IMPEDANCE Ph.D. Thesis
Paul David Jackins 1981 184 p
Avail: Univ. Microfilms Order No. 8123263

The scattering of a plane scalar wave by an impedance sphere at high frequencies is treated by a modified Watson transformation. The location of the poles in the complex order plane is determined for spheres whose surface impedence is either large or small. The interpretation of the angular momentum poles in terms of surface waves is demonstrated and shown to be in agreement with Keller's geometrical theory of diffraction. The amplitude and phase velocities of these surface or creeping waves are shown to depend in part upon the surface impedance. Representations are obtained for the primary waves in the nearby lit region and backward half space of the near field. The diffraction effects in the neighborhood of the shadow boundary are investigated and compared with classical diffraction theory. Near field solutions are extended to the far field by using the large argument asymptotic expressions for the Hankel functions. Dissert. Abstr.

N82-16800* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
MULTIPLE PURE TONE ELIMINATION STRUT ASSEMBLY Patent
Frank W. Burcham, inventor (to NASA) Issued 17 Nov. 1981 4 p Filed 11 Sep. 1980 Supersedes N80-32393 (18 - 23, p 3094)
(NASA-Case-FRC-11062-1; US-Patent-4,300,656; US-Patent-Appl-SN-185869; US-Patent-Class-181-214) Avail: US Patent and Trademark Office CSCL 20A

An acoustic noise elimination assembly is disclosed which has a capability for disrupting the continuity of fields of sound pressures forwardly projected from fans or rotors of a type commonly found in the fan or compressor first stage for air-breathing engines, when operating at tip speeds in the supersonic range. The assembly includes a tubular cowl defining a duct for delivering an air stream axially into the intake for a jet engine. A sound barrier, defined by a number of intersecting flat plates or struts has a line of intersection coincident with a longitudinal axis of the tubular cowl, which serves to disrupt the continuity of rotating fields of multiple pure tonal components of noise.

Official Gazette of the U.S. Patent and Trademark Office

N82-16801*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING Annual Progress Report
Carl H. Gerhold Jan. 1982 39 p refs
(Grant NAG1-11)
(NASA-CR-165102; APR-2) Avail: NTIS HC A03/MF A01 CSCL 20A

Progress in the refinement and evaluation of an analytical jet shielding model are summarized. The model consists of a point noise source impinging on a cylinder of heated flow in which the temperature and velocity are uniform across the cross section of the jet. The shielding jet is infinite in extent along the jet axis and the radius of the jet is constant. The analytical model was compared to experimental data for a point noise source impinging on an ambient temperature, subsonic jet and on a subsonic simulated hot jet using helium as the flow medium. Results of these comparisons are discussed. M.D.K.

N82-16802*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING Semiannual Progress Report
Carl H. Gerhold 30 Jun. 1981 26 p refs
(Grant NAG1-11)
(NASA-CR-165103) Avail: NTIS HC A03/MF A01 CSCL 20A

Development of jet noise source model, and comparison to experiments with a point noise source are summarized. The refinement of the noise source is expected to resolve discrepancies noted between previous analytical results with a point noise source model and experimental results for twin-jet shielding. Comparison of the analytical model with experimental program which include shielding of a point noise source by a jet and twin jet shielding are also made. The comparisons should serve to define more completely the mechanisms of shielding M.D.K.

N82-16803*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING Annual Progress Report
Carl H. Gerhold 31 Dec. 1980 38 p refs
(Grant NAG1-11)
(NASA-CR-165104) Avail: NTIS HC A03/MF A01 CSCL 20A

An analytical model a three-dimensional model, of twin-jet shielding, consisting of a point noise source impinging on a cylinder of heated flow in which the temperature and flow velocity are uniform across the cross-section is discussed. Wave equations are given for the regions outside the flow and within the flow cylinder and solutions are matched at the jet boundary under the conditions of continuity of pressure and continuity of the vortex sheet. The model was analyzed to identify mechanisms of transmission and diffraction which control sheilding in the shadow of the shielding jet. It was found that in the zone of the shadow region dominates, shielding is relatively insensitive to variations of such parameters as Mach Number and spacing ratio, but in the zone in which diffraction dominates; shielding is more sensitive to variations in Mach Number, jet temperature and spacing ratio. M.D.K.

N82-16804*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING Semiannual Progress Report
Carl H. Gerhold 6 Jun. 1980 18 p refs
(Grant NAG1-11)
(NASA-CR-165105) Avail: NTIS HC A02/MF A01 CSCL 20A

The development of an analytical model, an aircraft noise prediction computer program, to estimate the shielding of one jet by an adjacent jet in a twin jet configuration, is discussed. Noise estimations included consideration not only of noise sources on the aircraft, but also of the propagation path between source and receiver. A three-dimensional case is considered in which noise source is a discrete frequency point source at rest with respect to the jet axis. The shielding jet is assumed to be a cylinder of heated flow in which the temperature and flow velocity profiles are constant across the jet. The effect on shielding of the orientation of the emitting jet with respect to the shielding jet was investigated. Forward and backward scattering phenomena as well as the influence of jet flow speed were also investigated. M.D.K.

N82-16805*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING DEVELOPMENT OF A 3-DIMENSIONAL MODEL Progress Report
Carl H. Gerhold 4 Nov. 1980 24 p refs Sponsored by NASA
(NASA-CR-165106) Avail: NTIS HC A02/MF A01 CSCL 20A

The solution for a point source impinging on a cylinder of heated flow is presented. The indefinite integral is solved approximately using a saddle of point method. Comparison of the three-dimensional model to a previously obtained two-dimensional model of twin jet noise indicate the the approximate solution of the integral is valid. The model was analyzed to differentiate among the mechanims of shielding. Zone in which diffraction and transmission dominate are identified. The model was found to compare to experimental shielding results. M.D.K.

N82-16806*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF TWIN-JET SHIELDING TWO-DIMENSIONAL MODEL
Carl H. Gerhold 15 Aug. 1980 17 p refs
(Grant NAG1-11)
(NASA-CR-165107) Avail: NTIS HC A02/MF A01 CSCL 20A

The development of an analytical model to estimate the shielding of one jet by an adjacent jet in a twin jet configuration is discussed in relation to aircraft generated noise. The azimuthal redistribution of sound defining the shadow zone is investigated. Wave equations were solved in the plane normal to the jet axis to estimate the diffraction and reflection of sound by a heated, cylindrical jet. Thus, the noise source considered is essentially a line source assumed to emit at discrete frequency and at rest with respect to the shielding jet which is assumed to be a cylinder of heated flow in which the temperature is constant across the jet. Results show that the sound pressure decreases rapidly with frequency beyond the onset of the shielding to a minimum value. Results also show that increasing the spacing between the source and the jet shifts the curves toward higher frequencies. M.D.K.

N82-16807*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
COMMUNITY SENSITIVITY TO CHANGES IN AIRCRAFT NOISE EXPOSURE Final Report
S. Fidell, R. Horonjeff, S. Teffeteller, and K. Pearsons NASA Dec. 1981 122 p refs
(Contract NAS1-14611)
(NASA-CR-3490; BBN-4212) Avail: NTIS HC A06/MF A01 CSCL 20A

Interviews were conducted in the vicinity of Burbank Airport during a four month period during which a counterbalanced series of changes in aircraft noise exposure occurred due to runway repairs. Another interview was undertaken approximately one year after completion of the initial runway repairs. Noise measurements were made in conjunction with administration of a brief questionnaire to a near exhaustive sample of residents in four airport neighborhoods. The magnitude and direction of change of annoyance with aircraft noise exposure corresponded closely to the actual changes in physical exposure. Estimates were made of time constants for the rate of change of attitudes toward aircraft noise. S.L.

N82-16808*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE OF THE SR-3 PROPELLER MODEL AT 2 DEG AND 4 DEG ANGLE OF ATTACK
James H. Dittmar and Robert J. Jeracki Dec. 1981 30 p refs
(NASA-TM-82738; E-1051) Avail: NTIS HC A03/MF A01 CSCL 20A

The noise effect of operating supersonic tip speed propellers at angle of attack with respect to the incoming flow was determined. Increases in the maximum blade passage noise were observed for the propeller operating at angle of attack. The noise increase was not symmetrical with one wall of the wind tunnel having significantly more noise increase than the other wall. This was apparently the result of the rotational direction of the propeller. The lack of symmetry of the noise at angle of attack to the use of oppositely rotating propellers on opposite sides of an airplane fuselage as a way of minimizing the noise due to operation at angle of attack. J.D.H.

N82-16809*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SHOCK WAVE APPROACH TO THE NOISE OF SUPERSONIC PROPELLERS
James H. Dittmar and Edward J. Rice Dec. 1981 19 p refs
(NASA-TM-82752; E-1068) Avail: NTIS HC A02/MF A01 CSCL 20A

To model propeller noise expected for a turboprop aircraft, the pressure ratio across the shock at the propeller tip was calculated and compared with noise data from three propellers. At helical tip Mach numbers over 1.0, using only the tip shock wave, the model gave a fairly good prediction of the noise for a bladed propeller and for a propeller swept for aerodynamic purposes. However for another propeller, which was highly swept and designed to have noise cancellations from the inboard propeller sections, the shock strength from the tip over predicted the noise. In general the good agreement indicates that shock theory is a viable method for predicting the noise from these supersonic propellers but that the shock strengths from all of the blade sections need to be properly included. M.G.

N82-16810*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
PREDICTION OF SOUND RADIATION FROM DIFFERENT PRACTICAL JET ENGINE INLETS Semiannual Status Report, 1 Jun. 1981 - 1 Dec. 1981
Ben T. Zinn and William L. Meyer 1982 127 p refs
(Grant NAG3-67)
(NASA-CR-165120) Avail: NTIS HC A07/MF A01 CSCL 20A

The computer codes necessary for this study were developed and checked against exact solutions generated by the point source method using the NASA Lewis QCSEE inlet geometry. These computer codes were used to predict the acoustic properties of the following five inlet configurations: the NASA Langley Bellmouth, the NASA Lewis JT15D-1 Ground Test Nacelle, and three finite hyperbolic inlets of 50, 70 and 90 degrees. Thirty-five computer runs were done for the NASA Langley Bellmouth. For each of these computer runs, the reflection coefficient at the duct exit plane was calculated as was the far field radiation pattern. These results are presented in both graphical and tabular form with many of the results cross plotted so that trends in the results verses cut-off ratio (wave number) and tangential mode number may be easily identified. Author

N82-16811# Pennsylvania State Univ., University Park. Applied Research Lab.
NOISE GENERATION BY GAS JETS IN A TURBULENT WAKE Ph.D. Thesis
John J. Gavigan 9 Apr. 1981 124 p refs
(Contract N00024-79-C-6043)
(AD-A106223; ARL/PSU-TM-81-99) Avail: NTIS HC A06/MF A01 CSCL 20/1

Radiation noise is generated by the interaction of gas jets with turbulent liquid. Although this phenomenon has long been known, the mechanism of noise generation and its functional relationship to important parameters are not well understood. No experimental studies of gas jet-turbulence interaction noise under controlled conditions can be found in the literature. To remedy this paucity of experimental data, measurements of this phenomenon were made in the 1.22 m diameter test section of the Garfield Thomas Water Tunnel. Gas was exhausted from the aft end of the strut-mounted test body into the turbulent wake. A directional hydrophone mounted outside the flow in a water-filled tank on one side of the test section was used to make one-third-octave-band acoustic measurements in the frequency range 5 - 50 kHz. By varying the gas exhaust orifice diameters, gas flow rates, and water speeds, the interdependence of the important parameters to radiated noise was determined. For the range of variables used in these experiments, the radiated noise is primarily a function of the ratio of orifice diameter to turbulence length scale, and only secondarily, a function of gas flow rates. Analysis of the results indicate that noise generated by the formation, division, coalescence, and collapse of bubbles can be related to the critical Weber number of the flow.
Author (GRA)

N82-16812# Naval Research Lab., Washington, D. C.
APPROXIMATE FLUID-STRUCTURE INTERACTION THEORIES FOR ACOUSTIC ECHO SIGNAL PREDICTIONS Final Report
H. Huang Oct. 1981 17 p refs
(RR0230301)
(AD-A106349; NRL-MR-4661) Avail: NTIS HC A02/MF A01 CSCL 17/1

An approximation scheme for predicting the acoustical echo signals from submerged elastic structures irradiated by incident pulses is proposed and investigated for its effectiveness. This scheme utilizes various approximate fluid-structure interaction theories to first determine the resultant pressure and normal

acceleration on the fluid-structure interface and thereform calculates the far field echo signals by integrating the Helmholtz integral exactly. It is found that a theory termed the second order doubly asymptotic approximation is promising for this scheme. An optimum computation scheme could be a combination of the exact and various approximate theories depending on the wavelength of the incident pulse and the geometry and the dynamic characteristics of the structure. Author

N82-16813# Texas Univ. at Arlington. Applied Research Labs.

MEASUREMENTS AND ANALYSIS OF ACOUSTIC BOTTOM INTERACTION IN THE NORTHWESTERN MEXICAN BASIN

Michael W. Hooper, Gregory D. Ingram, and Stephen K. Mitchell 5 Oct. 1981 54 p refs
(Contract N00014-78-C-0329)
(AD-A107551; ARL-TR-81-37) Avail: NTIS HC A04/MF A01 CSCL 08/10

An engineering test of the Acoustic Data Capsule (ACODAC) was conducted in the Western Gulf of Mexico on 27 April 1979. In addition, bottom loss data were collected. These data were reduced using ARL:UT's multipath processing system. Calculated bottom loss increased with frequency and bottom grazing angle, ranging from approximately 1 dB to 6 dB. Using available geoacoustic data and a bottom loss model, theoretical bottom losses were generated. A good match between actual and theoretical values was obtained. Thus, a relatively accurate geoacoustic model of the Western Gulf of Mexico was derived. Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-16814*# California Inst. of Tech., Pasadena. Radiation Lab.

ION-BEAM-ENHANCED ADHESION IN THE ELECTRONIC STOPPING REGION

J. E. Griffith (Bell Telephone Lab., Murray Hill, N.J.), Yuanxun Qiu (Lanzhou Univ., China), and T. A. Tombrello Dec. 1981 12 p refs Submitted for publication
(Grants NGR-05-002-333; NSF PHY-79-23638; Contract NGW-148)
(NASA-CR-163467; BAP-25) Avail: NTIS HC A02/MF A01 CSCL 20H

The use of ion beams in the electronic stopping region to improve the adhesion of insulators to other materials is described. In particular, the bonding of Au films to Teflon, ferrite, and SiO2 was improved by bombarding them with He and Cl, respectively. Improvements in bonding were also observed for Au on glass, Au and Cu on sapphire, and Si3N4 on Si. The mechanism is apparently associated with sputtering and track forming processes occurring in the electronic stopping region. Some applications are discussed. M.G.

N82-16815*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE TWO-PHOTON ABSORPTIVITY OF ROTATIONAL TRANSITIONS IN THE A2 SIGMA HYPERON + (V PRIME = 0) - X-2 PION (V PRIME PRIME = 0) GAMMA BAND OF NITRIC OXIDE

K. P. Gross (Stanford Univ., Calif.) and R. L. McKenzie Jan. 1982 28 p refs
(NASA-TM-81335; A-8758) Avail: NTIS HC A03/MF A01 CSCL 20H

A predominantly single-mode pulsed dye laser system giving a well characterized spatial and temporal output suitable for absolute two-photon absorptivity measurements was used to study the NO gamma(0,0) S11 + R21 (J double prime = 7-1/2) transition. Using a calibrated induced-fluorescence technique, an absorptivity parameter of 2.8 + or - 1.4 x 10 to the minus 51st power cm to the 6th power was obtained. Relative strengths of other rotational transitions in the gamma(0,0) band were also measured and shown to compare well with predicted values in all cases except the O12 (J double prime = 10-1/2) transition. Author

N82-16816# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

INVESTIGATIONS OF NONREACTIVE VIBRATIONAL AND ROTATIONAL EXCITATION IN SMALL, POTENTIALLY REACTIVE ION MOLECULE SYSTEMS AT ENERGIES BELOW 6eV Ph.D. Thesis - Georg-August Univ. [UNTERSUCHUNGEN ZUR NICHTREAKTIVEN VIBRATIONS- UND ROTATIONSANREGUNG IN KLEINEN, POTENTIELL REAKTIVEN ION-MOLEKUELSYSTEMEN BEI ENERGIEN UNTERHALB VON 6eV]

Wolfgang Tepperwien Apr. 1981 93 p refs In GERMAN
(MPIS-4/1981; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

The excitation of vibrational and rotational degree of freedom of molecules during ionic collision, a chemical elementary process related to chemical kinetics, is discussed. Molecular radiation experiments with single collisions were performed. Nonreactive vibrational and rotational excitation with small potential reactive ion molecule systems were investigated. Mostly higher vibrational changes take place. It is found that the hydrogen molecules are vibrationally excited by the collision, while the rotational degree of freedom remains relaxed. Transl. by E.A.K.

N82-16817# Physics International Co., San Leandro, Calif.

PHYSICS OF ELECTROSTATIC LENS Final Report

Sep. 1981 3 p
(Contract N00014-79-C-0749)
(AD-A105262) Avail: NTIS HC A02/MF A01 CSCL 20/7

The purpose of this program was to study the physics of the ion-energy boosting electrostatic lens for collective ion acceleration in the Luce diode. Extensive work was done in preparation for experiments on the PI Pulserad 1150. Analytic work was done on the orbit of protons in a mass spectrometer and a copper stack for nuclear activation analysis of proton energy spectrum has been designed. Unfortunately, a parallel program which would provide the Luce diode for the collective ion acceleration experiment never materialized. As a result no experiments were actually performed on the Pulserad 1150. GRA

N82-16818# JAYCOR, Alexandria, Va.

COMPUTATIONAL STUDY OF MAGNETIC DAM EFFECTS IN A HIGH IMPEDANCE DIODE

R. J. Barker, Shyke A. Goldstein, and A. T. Drobot (Science Applications, Inc., McLean, Va.) Washington NRL 14 Oct. 1981 41 p refs Sponsored by Navy
(AD-A106154; NRL-MR-4642) Avail: NTIS HC A03/MF A01 CSCL 02/7

Computer simulations have been conducted to test the 'magnetic dam' concept as a means for boosting the overall ion efficiency of high impedance diodes. The 'dam' consists of a cell located immediately behind the anode foil containing a wire along its central axis which carries a current flowing in a direction opposite to that in the diode gap. The azimuthal magnetic field generated by the wire current, I sub w, reflects the electrons crossing the foil back into the A-K gap at higher radii where their space charge can enhance ion emission over relatively large areas. Significant increases in the ion current were observed for several values of I sub w but a simultaneous increase in electron current prevented gains in overall ion efficiency. Instead, only decreased impedances were observed. The cause of this phenomenon is explained and indicates solutions which could benefit a wide range of future diode designs. Author (GRA)

N82-16819# Rockwell International Corp., Thousand Oaks, Calif. Electronics Research Center.

HIGH RESISTIVITY MOLECULAR BEAM EPITAXIAL AlGaAs FOR DEVICE APPLICATIONS Final Report, 1 May 1978 - 30 Apr. 1980

W. A. Hill, D. L. Miller, and D. R. Chen May 1981 53 p refs
(Contract N00014-78-C-0370; RF62581001)
(AD-A107597; ERC41006.4FR) Avail: NTIS HC A04/MF A01 CSCL 20/7

High resistivity epitaxial layers of AlxGa1-xAs have been produced by molecular beam epitaxy. These layers have been incorporated, as a buffer layer, in the fabrication of GaAs MESFETs and the results are discussed. Device analysis includes an assortment of low frequency and DC measurements as well as RF measurements. Author (GRA)

N82-16820# Texas Univ. at Arlington. Dept. of Computer Science.

THE STUDY OF ATOM-ATOM ELECTRON-MOLECULE AND PHOTON-MOLECULE PROCESSES Final Technical Report, 1 Apr. 1975 - 31 Mar. 1980

J. C. Browne and E. J. Shipsey 25 Oct. 1981 9 p refs
(Contract N00014-75-C-0498)
(AD-A107991) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research program has had two principal streams of activity. The first, and the major consumer of effort, has been the computation of cross-sections and rate coefficients for significant collision processes between light atoms and ions. The other stream of activity has been development of computational methods in collision mechanics. The cross-section computations have on several occasions predicted experiments and/or corrected experimental errors. The prediction of the efficiency of the reaction Cs + H yields Cs(+) + H(-) was listed by the American Physical Society as a significant result for plasma physics in 1976. The first prediction of a process which could lead to a soft X-ray laser (Li + He(++) yields Li(+) + He(+*) yields Li(+) + He(+) + h(nu)) was made in 1978. The population inversion predicted has since been experimentally validated. Author (GRA)

N82-16821# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

MOLECULAR DYNAMICS CALCULATIONS FOR SODIUM USING PSEUDOPOTENTIAL THEORY Ph.D. Thesis - New Mexico Univ.

Richard E. Swanson Apr. 1981 193 p refs
(AD-A108014; AFIT-CI-81-11D) Avail: NTIS HC A09/MF A01 CSCL 20/8

We study the equation of state of sodium using the molecular dynamics technique whereby the classical motion of a system of ions is solved with the aid of computers. The interaction potential between pairs of sodium ions consists of Coulomb and Born-Mayer repulsion terms and an effective ion-ion interaction derived from pseudopotential theory. This theory includes the effects of electron gas screening, exchange, and correlation. We use a model pseudopotential with parameters fit to experimental low-temperature data. By using this technique, we are able to begin with an atomic description of a simple metal and proceed to calculate its macroscopic thermodynamic properties. We calculate equation-of-state points consisting of the total internal energy in volume and temperature space. We illustrate the unique capabilities of the molecular dynamics technique by inducing a dynamic bcc-to-hcp martensitic phase change. The results of this study demonstrate that the molecular dynamics technique, coupled with an interaction potential that adequately describes the ion-ion interaction in a simple metal, can be used to calculate the macroscopic properties of such systems. GRA

N82-16822# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.

RELATIVISTIC HEAVY-ION EXPERIMENTS

H. G. Pugh Aug. 1981 30 p refs Presented at the 12th Intern. Symp. on Multiparticle Dyn., South Bend, Ind., 21-26 Jun. 1981
(Contract W-7405-eng-48)
(DE81-030544; LBL-13029; CONF-8106157-1) Avail: NTIS HC A03/MF A01

Objectives of high energy nucleus-nucleus studies are outlined. Bevalac experiments on the formation of hot high-density equilibrated nuclear matter are discussed. Future programs are outlined, including research at the CERN ISR. DOE

N82-16823# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.

COLLISIONS OF FAST MULTICHARGED IONS IN GAS TARGETS: CHARGE TRANSFER AND IONIZATION

A. S. Schlachter May 1981 18 p refs Presented at the 2nd Workshop on EBIS and Related Topics, Paris, 11-15 May 1981
(Contract W-7405-eng-48)
(DE81-030541; LBL-13156; CONF-8105113-1) Avail: NTIS HC A02/MF A01

Measurements of cross sections for charge transfer and ionization of H2 and rare-gas targets were made with fast, highly stripped projectiles in charge states as high as 59+. An empirical scaling rule for electron-capture cross section in H2 valid at energies above 275 keV/amu was found. Similar scaling might exist for other target gases. Cross sections are generally in good agreement with theory. A scaling rule was found for electron loss from H in collisions with a fast highly stripped projectile, based on Olson's classical-trajectory Monte-Carlo calculations, and confirmed by measurements in an H2 target. A similar scaling rule was for net ionization of rare-gas targets, based on Olson's CTMC calculations and the independent-electron model. Measurements are essentially consistent with the scaled cross sections. Calculations and measurements of recoil-ion charge-state spectra show large cross sections for the production of highly charged slow recoil ions. DOE

N82-16824# Oak Ridge National Lab., Tenn. Engineering Physics Div.

CALCULATED NEUTRON AND GAMMA-RAY ENERGY SPECTRA FROM 14-MeV NEUTRONS STREAMING THROUGH AN IRON DUCT: COMPARISON WITH EXPERIMENT

R. T. Santoro, R. G. Alsmiller, Jr., J. M. Barnes, G. T. Chapman, and J. S. Tang Sep. 1981 64 p refs Submitted for publication
(Contract W-7405-eng-26)
(DE81-030626; ORNL/TM-7878) Avail: NTIS HC A04/MF A01

Integral experiments that measure the streaming of approximately 14 MeV neutrons through a 0.30 m diameter iron duct (L/D approximately 3) imbedded in a concrete shield were carried out. Calculated and measured neutron and gamma ray energy spectra are compared at sixteen detector locations on and off the cylindrical axis of the duct. The measured spectra were obtained using an NE-213 liquid scintillator detector with pulse shape discrimination to simultaneously resolve neutron and gamma ray events. The calculated spectra were obtained using a computer code network that incorporates discrete ordinates and Monte Carlo. These two radiation transport methodologies are required to properly account for neutrons that single scatter from the duct to the detector. The calculated and measured outgoing neutron energy spectra above 850 keV agree within 5 to 50% depending on detector location and neutron energy. The calculated and measured gamma ray spectra above 750 keV are also in favorable agreement, approximately 5 to 50%, depending on detector location and gamma ray energy. DOE

N82-16825# Oak Ridge National Lab., Tenn. Physics Div.

ELECTRON-IMPACT EXCITATION OF IONS

D. H. Crandall 1981 52 p refs Presented at the NATO Advanced Study Summer Inst., Baddeck, Nova Scotia, 13-26 Sep. 1981
(Contract W-7405-eng-26)
(DE81-030806; CONF-810958-1) Avail: NTIS HC A04/MF A01

Electron-ion beam experiments are reviewed. Techniques, difficulties, and present trends in this area are discussed. Measured cross sections are compared with theoretical results and the current level of agreement is assessed. DOE

N82-16826# European Organization for Nuclear Research, Geneva (Switzerland).

OASIS IN THE DESERT: WEAKLY BROKEN PARITY IN GRAND UNIFIED THEORIES

Goran Senjanovic Jul. 1981 21 p refs Presented at the 4th Warsaw Symp. on Elementary Particle Phys., Kazimierz, Poland, May 1981 Prepared jointly with Brookhaven National Lab.
(Contract DE-AC02-76CH-00016)
(DE81-031963; BNL-29987; CONF-8105114-1) Avail: NTIS HC A02/MF A01

Low energy parity restoration in simple grand unified theories, such as SO(10), is discussed. The consistency of phenomenological requirements and unification constraints is emphasized and various predictions of the theory are stressed, in particular substantially

lighter W and Z bosons than in the stand model and increased stability of the proton with mu/sub p/ approximately one hundred undecillion. DOE

N82-16827# Sandia Labs., Albuquerque, N. Mex.
LOW-TEMPERATURE ELECTRON SPIN RESONANCE IN (TMTSF) 2PF6 IN THE HIGH PRESSURE METALLIC PHASE
L. J. Azevedo, J. E. Schirber, R. L. Greene, and E. M. Engler 1981 12 p refs Presented at the Intern. Conf. on Low Dimensional Conductors, Boulder, Colo., 10 Aug. 1981 Prepared in cooperation with IBM Corp., San Jose, Calif.
(Contract DE-AC04-76DP-00789)
(DE81-030233; SAND-81-1115C; CONF-810864-2) Avail: NTIS HC A02/MF A01

The electron spin resonance of (TMTSF) 2PF6 was observed at low fields (H0< 110 Oe) in the high pressure metallic phase (p > or = 6.5 kbar) in the temperature range 1 to 4K. The anisotropy in the g value is similar to that observed at ambient pressure above the metal insulator transition. Linewidth is very narrow and the spin susceptibility strongly decreases as the superconducting transition is approached from above. This is interpreted as evidence for single paired superconductivity. Superconductivity is observed at 1.1K and the critical field has angular dependence in the bc plane. These observations lead to the conclusions that (TMTSF) 2PF6 is a single paired superconductor. DOE

N82-16828# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
OBSERVING SOLITONS IN ONE DIMENSIONAL MAGNETIC SYSTEMS
George Reiter 1981 10 p refs Presented at the Symp. on Neutron Scattering, Argonne, Ill., 11-12 Aug. 1981
(Contract DE-AC02-76CH-00016)
(DE81-029919; BNL-29957; CONF-810840-5) Avail: NTIS HC A02/MF A01

Classical models of one dimensional magnetic systems show that in addition to the linear spin wave excitations, there should exist localized, large amplitude excitations that can move along the chains while retaining their integrity. It is expected that these excitations, solitons, exist in real materials. The progress made to date in observing solitons in one dimensional magnets by means of neutron scattering, and the difficulties that still remain in unambiguously identifying the soliton contributions to S(q, omega) are discussed. DOE

N82-16829# General Atomic Co., San Diego, Calif.
NEUTRAL DENSITY MEASUREMENTS IN DOUBLET 3
J. S. deGrassie, J. C. DeBoo, M. A. Mahdavi, N. Ohyabu, and M. Shimada (Japan Atomic Energy Research Inst.) Aug. 1981 16 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981
(Contracts DE-AT03-80SF-11512; DE-AT03-76ET-51011)
(DE82-000497; GA-A-16460; CONF-811113-14) Avail: NTIS HC A02/MF A01

In the Doublet III Tokamak a variety of cross sectionally shaped plasmas were investigated. Simple magnetically shielded ionization gauges monitoring the working gas pressure show a striking dependence upon plasma shape. Average neutral density varies over two orders of magnitude. In the extreme of the simplified poloidal divertor shapes the pressure exceeds 0.001 torr. DOE

N82-16830# Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
MACROMOLECULAR STRUCTURAL CHANGES IN BITUMINOUS COALS DURING EXTRACTION AND SOLUBILIZATION Annual Technical Progress Report, 1 Sep. 1980 - 31 Aug. 1981
N. A. Peppas, Mary Elizabeth Hill-Lievense, Donald T. Hooker, II, and Lucy M. Lucht 1981 236 p refs
(Contract DE-FG22-89PC-30222)
(DE82-000687; DOE/PC-30222/T1) Avail: NTIS HC A11/MF A01

Seven coal samples ranging from a lignite with 69.95% carbon to an anthracite with 94.17% carbon on a dry mineral matter-free (dmmf) basis were extracted with pyridine at its reflux temperature for two weeks. The coal matrices obtained were subjected to two degradation techniques, the Sternberg reductive alkylation technique and the Miyake alkylation technique. Gel permeation chromatographic analysis of pyridine-extracted liquids of the alkylated coal showed average molecular weights smaller than those of the original coal extracts. Electron impact mass spectrometry was used to obtain the mass spectra of these alkylated coal samples. Based on investigation of the recurring pattern of the peaks of the mass spectra of these products it was concluded that a cluster size of 126 to 130 is characteristic of the crosslinked structure of the coal studied. In addition, several chemical compounds in the range of m/e 78-191 were identified. DOE

N82-17045*# Vanderbilt Univ., Nashville, Tenn. Dept. of Civil and Environmental Engineering.
A DETERMINATION OF THE CURRENT DENSITY IN ELECTRON BEAMS
Robert J. Beil *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 31 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20H

N82-17076*# Berry Coll., Mount Berry, Ga. Dept. of Physics.
A STUDY OF THE RELATIVISTIC RISE IN IONIZATION AS MEASURED BY ION CHAMBERS OF DIFFERENT DESIGN
Julian B. Shand, Jr. *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 7 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20H

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-16831# Sandia Labs., Albuquerque, N. Mex. Mechanical Metallurgy Div.
EVALUATION OF THREE PARTIALLY VOLATILE NEUTRON SHIELDS FOR HIGH-PERFORMANCE SHIPPING CASKS
H. J. Rack and H. S. Pearson (Applied Technical Services) Feb. 1981 41 p
(Contract DE-AC04-76DP-00789)
(DE82-000245; SAND-80-2303; TTC-0149) Avail: NTIS HC A03/MF A01

The thermal stability and mechanical behavior of three partially volatile candidate neutron shield materials were evaluated. The results indicate that silicone based rubbers, impregnated with elemental boron or boron carbide, Boro-silicone 236 and Bisco NS-I respectively are more thermally stable than are borated beechwoods, e.g., Permali JN. Mechanical property measurements indicated, however, that the compressive strength of the borated beechwood is 10 to 48 times higher than that of the silicone-based rubbers. The compressive strengths of the borated beechwood and boron carbide impregnated silicone rubber were substantially more sensitive to test temperature than was the compressive strength of the boron impregnated silicone rubber. The compressive strengths and energy absorbing capability of the boron impregnated silicone rubber is not affected by prior thermal exposure at 425 K for 1000h. DOE

N82-16832# California Univ., Livermore. Lawrence Livermore Lab.
NEUTRON CAPTURE GAMMA-RAY SPECTROSCOPIC MEASUREMENTS IN THE ACTINIDE REGION
R. W. Hoff, R. W. Lougheed, G. Barreau (Inst. Max vonLaue/Paul Langevin), H. Boerner (Inst. Max vonLaue/Paul Langevin), W. F. Davidson (Inst. Max vonLaue/Paul Langevin), K. Schreckenbach (Inst. Max vonLaue/Paul Langevin), D. D. Warner (Inst. Max vonLaue/Paul Langevin), T. vonEgidy (Inst. Max vonLaue/Paul Langevin), and D. H. White (Western Oregon State Coll.,

Monmouth) Sep. 1981 15 p refs Presented at the 4th Intern. Symp. on Neutron-Capture Gamma-Ray Spectry. and Related Topics, Grenoble, France, 7-11 Sep. 1981
(Contract W-7405-eng-48)
(DE81-030316; UCRL-85325; CONF-810920-14) Avail: NTIS HC A02/MF A01

From recent neutron capture gamma-ray measurements, experimental data for states involving quasiparticle-vibrational admixtures in Ra-227, Th-231, Th-233, U-235, U-237, and U-239 were compared with theoretical calculations by Soloviev's group. This analysis shows the experimental level structure is more complex than that calculated. In the levels of BK-250, four Gallagher-Moszkowski pairs are observed. The moment of inertia for each band with antiparallel alignment of odd-nucleon momenta is systematically larger than for its parallel-aligned mate. DOE

N82-16833# Sandia Labs., Albuquerque, N. Mex. Transportation Systems Development and Testing Div.
OPERATIONAL AND REGULATORY IMPACTS OF REGIONAL MANAGEMENT ON TRANSPORTATION OF COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE
C. G. Shirley, E. L. Wilmot, and E. W. Shepherd Sep. 1981 36 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000967; SAND-81-1509; TTC-0228) Avail: NTIS HC A03/MF A01

The current US low-level waste management situation and the conditions and requirements for management on a regional basis were examined. Using 1979 low-level waste volumes shipped to commercial burial grounds and six management regions, transportation requirements were estimated and compared for the two management scenarios in terms of cumulative shipping distance and transportation cost. Effects of these results on the demand for transportation services and equipment and on population risks were considered. Finally, current regulatory issues and the potential effects of regional management on regulation of low-level waste transportation were reviewed. DOE

N82-16834# Pacific Northwest Lab., Richland, Wash.
DEVELOPMENT OF IN-CAN MELTING PROCESS AND EQUIPMENT, 1979 AND 1980
L. L. Petkus, D. E. Larson, W. J. Bjorklund, and L. K. Holton Sep. 1981 46 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001050; PNL-3957) Avail: NTIS HC A03/MF A01

Nonradioactive process testing continued with the in-can melter as part of an investigation into the applicability of this vitrification process to various calcined high level and incinerator ash radioactive wastes. How waste composition and canister fins affect in-can melter capacity and how waste composition affects glass quality were examined. Process performance proved to be generally satisfactory. Pilot scale in-can melter runs were performed with synthetic, nonradioactive, high level wastes to produce eight canisters of glass. The synthetic waste processed included high level wastes as well as transuranic ash waste. Full scale in-can melter runs using nonradioactive materials were also conducted, producing ten canisters of glass. In the full scale in-can melter furnace the baffles separating the six heating zones were removed because of baffle warping. A remotely operated section connecting the spray calciner to the canister was tested. Some problems were encountered with calcine plugging. DOE

N82-16835# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
IMMOBILIZATION OF HIGH-LEVEL WASTE
T. H. Gould, Jr. 1981 32 p Presented at the Ann. Meeting of the Inst. of Chem. Eng., New Orleans, 8-12 Nov. 1981
(Contract DE-AC09-76SR-00001)
(DE81-025595; DP-MS-81-33; CONF-811108-1) Avail: NTIS HC A09/MF A01

The development of technology to immobilize high level radioactive waste into durable solid forms is addressed. Specifically, the immobilization of high level waste at Savannah River, the program to develop waste forms, and the waste form evaluation and selection process are discussed. DOE

N82-16836# Oak Ridge National Lab., Tenn. Office of the Integrated Data Base Program.
SPENT FUEL AND RADIOACTIVE WASTE INVENTORIES AND PROJECTIONS AS OF DECEMBER 31, 1980
Sep. 1981 293 p refs
(Contract W-7405-eng-26)
(DE82-000307; DOE/NE-0017) Avail: NTIS HC A13/MF A01

Current inventories and characteristics of commercial spent fuels and both commercial and US Department of Energy radioactive wastes were compiled, based on the most reliable information available from Government sources and the open literature, technical reports, and direct contacts. Future waste generation rates and characteristics of these materials to be accumulated over the remainder of this century are also presented, based on a present projection of US commercial nuclear power growth and expected defense-related and industrial and institutional activities. Materials considered are: spent fuel, high-level wastes, transuranic waste, low-level waste, remedial action waste, active uranium mill tailings, and airborne waste. For each category, current and projected inventories are given through the year 2000. The land usage requirements are given for storage/disposal of low-level and transuranic wastes, and for the present inventories of inactive uranium mill tailings. DOE

N82-16837# Sandia Labs., Albuquerque, N. Mex. Transportation Technology Center.
OPERATIONAL AND REGULATORY IMPACTS OF REGIONAL MANAGEMENT ON TRANSPORTATION OF COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE
C. G. Shirley, E. L. Wilmot, and E. W. Shepherd 1981 4 p refs Presented at the ANS Winter Meeting, San Francisco, 29 Nov. - 4 Dec. 1981
(Contract DE-AC04-76DP-00789)
(DE81-025399; SAND-81-1509C; CONF-811113-3) Avail: NTIS HC A02/MF A01

A factor of two reduction in total shipping distance and cost is possible on a national scale if regional disposal sites are employed. Likewise, population risks and the demand for transportation services and equipment would be proportionally reduced because of shorter shipment distances and trip durations. The fate of regionalization of low level waste management and achievement of the cost and risk benefits that it implies is dependent on solving technical problems and resolving the institutional issues which result in multiple levels of regulations. DOE

N82-16838# Hanford Engineering Development Lab., Richland, Wash.
STAFF-5, A TWO-DIMENSIONAL COMPUTER MODEL FOR SIMULATION OF THE PERFORMANCE OF SPENT FUEL IN STORAGE/DISPOSAL
S. R. Fields and J. F. Fletcher Aug. 1981 123 p refs
(Contract DE-AC14-76FF-02170)
(DE82-000043; HEDL-TC-1601-Rev-1) Avail: NTIS HC A06/MF A01

STAFF-5, (Spent Fuel Temperature and Cladding Failure Forecaster), a two-dimensional model of a light-water reactor fuel assembly in a canister, was developed to predict spent fuel temperature and study cladding performance during long-term storage and/or disposal. When symmetry of the storage configuration is considered, STAFF-5 provides three-dimensional simulation of the fuel assembly and canister. The heat transfer portion of STAFF was validated against experimental results from instrumented tests of fuel assemblies in selected disposal configurations. DOE

N82-16839# Brookhaven National Lab., Upton, N. Y.
KAON-INDUCED NUCLEAR REACTIONS
C. B. Dover 1981 12 p refs Presented at the TRIUMF Kaon Factory Phys. Workshop, Vancouver, Canada, 10-14 Aug. 1981
(Contract DE-AC02-76CH-00016)
(DE81-030552; BNL-29984; CONF-810869-1) Avail: NTIS HC A02/MF A01

Some reactions which could be studied at a future kaon factory are discussed. These include elastic and inelastic regeneration of neutral kaons on nuclei, production of high spin lambda and sigma hypernuclear states via the (pi/sup +-/,K(+)) reaction, and the K(-),K(+) process as a means of exploring the spectroscopy of doubly strange hypernuclei. DOE

N82-16840# Washington Univ., Seattle.
QUARK-GLUON PLASMA AND THE LITTLE BANG
L. McLerran Jun. 1981 32 p refs Presented at Intern. Conf. on Phys. in Collision: High Energy ee/ep/pp Interactions, Blacksburg, Va., 28 May 1981
(Contract DE-AC06-76ER-01388)
(DE81-030320; DOE/ER-01388/861; CONF-8105109-2) Avail: NTIS HC A03/MF A01

A space time picture of the fragmentation and central regions is presented for extremely high energy head on heavy nucleus collisions. The energy densities of the matter produced in such collisions are estimated. Speculations concerning the possible formation of a quark gluon plasma are discussed, as are possible experimental signals for analyzing such a plasma. DOE

N82-16841# California Univ., Livermore. Lawrence Livermore Lab.
COPPER-COATED LASER-FUSION TARGETS USING MOLECULAR-BEAM LEVITATION
Michael J. Rocke 8 Sep. 1981 14 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981
(Contract W-7405-eng-48)
(DE82-000644; UCRL-86114; CONF-811113-11) Avail: NTIS HC A02/MF A01

A series of diagnostic experiments at the Shiva laser fusion facility required targets of glass microspheres coated with 1.5 to 3.0 micrometers of copper. Previous batch coating efforts using vibration techniques gave poor results due to microsphere sticking and vacuum welding. Molecular Beam Levitation (MBL) represented a noncontact method to produce a sputtered copper coating on a single glass microsphere. The coating specifications that were achieved resulted in a copper layer up to 3 micrometers thick with the allowance of a maximum variation of 10 nm in surface finish and thickness. These techniques developed with the MBL may be applied to sputter coat many soft metals for fusion target applications. DOE

N82-16842# California Univ., Livermore. Lawrence Livermore Lab.
TAPE EXTENSOMETER SENSITIVITY AND RELIABILITY
J. L. Yow, Jr. and Dale G. Wilder 21 Sep. 1981 33 p refs Presented at the 24th Ann. Meeting of the Assoc. of Eng. Geol., Portland, Oregon, 27 Sep. - 2 Oct. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE82-000064; UCRL-86100; CONF-810972-1) Avail: NTIS HC A03/MF A01

A test of retrievable storage in granite of spent nuclear reactor fuel was conducted. The rock was instrumented to measure temperatures, stress changes, and displacements. Periodic tape extensometer readings provide test drift convergence data. Vertical and horizontal tape readings are made at five locations in each of two 11 ft x 11 ft drifts and six locations in a 15 ft x 20.5 ft drift. The sensitivity of the readings to temperature effects, errors in temperature corrections, change of steel tape, and change of operator was examined. Calculated corrections for temperature-induced changes in distance range from 0.0001 in. to 0.003 in./C. A tape changeout evidenced both a systematic error apparently due to slight changes in tape registration during punching and to nonidentical location of punched holes in the two tapes and a random error due to variability of reading and punching operations. These errors were corrected by making duplicate measurements for the tapes. DOE

N82-16843# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
LEACHING OF NUCLEAR-WASTE FORMS
John A. Stone 1981 17 p refs Presented at 8th Ann. Meeting of the Federation of Anal. Chem. and Spectry. Soc., Philadelphia, 20-25 Sep. 1981
(DE81-030490; DP-MS-81-44; CONF-810956-1) Avail: NTIS HC A02/MF A01

An overview of leach test methods and factors that affect leaching of nuclear waste solids is presented. Some analytical requirements are discussed. DOE

N82-16844# California Univ., Livermore. Lawrence Livermore Lab.
DIAGNOSTIC DEVICE FOR BUNCHED ELECTRON BEAMS
J. C. Garrison and A. Szoke 19 Aug. 1981 20 p refs Presented at 1981 Workshop on Free Electron Lasers, Sun Valley, Idaho, 22 Jun. 1981
(Contract W-7405-eng-48)
(DE82-000639; UCRL-86617) Avail: NTIS HC A02/MF A01

It is noted that the operation of free electron lasers depends crucially on the bunching of the electron beam; it must be precisely modulated at the desired laser frequency, and it must occupy a narrow energy centered on a resonant electron energy. A method for measuring these properties directly by steering the e-beam through a properly designed wiggler magnet and observing the emitted radiation is proposed. This kind of device is closely related to the optical klystron, and it is expected that such devices will be important for understanding and improving the operation of free electron lasers, especially those with low gain. DOE

N82-16845# Battelle Pacific Northwest Labs., Richland, Wash.
NUCLEAR WASTE MANAGEMENT Quarterly Progress Report, Apr. - Jun. 1981
T. D. Chikalla and J. A. Powell Sep. 1981 136 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001605; PNL-3000-10) Avail: NTIS HC A07/MF A01

Reports and summaries are presented for the following: high-level waste process development; alternative waste forms; TMI zeolite vitrification demonstration program; nuclear waste materials characterization center; TRU waste immobilization; TRU waste decontamination; krypton implantation; thermal outgassing; iodine-129 fixation; NWVP off-gas analysis; monitoring and physical characterization of unsaturated zone transport; well-logging instrumentation development; verification instrument development; mobility of organic complexes of radionuclides in soils; handbook of methods to decrease the generation of low-level waste; waste management system studies; waste management safety studies; assessment of effectiveness of geologic isolation systems; waste/rock interactions technology program; high-level waste form preparation; development of backfill materials; development of structural engineered barriers; disposal charge analysis; and analysis of spent fuel policy implementation. DOE

N82-16846# Piedmont Engineers, Greenville, S.C.
NUCLEAR ENERGY CENTER CONCEPTUAL STUDY. PHASE 3: SITE SPECIFIC EVALUATION - ENVIRONMENTAL RECREATION USE AND PHYSICAL CHARACTERISTICS OF LAKE HARTWELL
Jan. 1981 265 p refs
(Contract DE-AS05-78CR-06074)
(DE81-027337; DOE/OR-06074/1-Vol-3) Avail: NTIS HC A12/MF A01

Socio-economic factors related to the proposed siting of a 15000 MW, twelve-unit nuclear energy center in Anderson County, South Carolina, are presented. Topics included recreational use of Lake Hartwell, terrestrial and aquatic ecology, and atmospheric studies. DOE

N82-16847# Florida State Univ., Tallahassee. Dept. of Chemistry.
RESEARCH IN NUCLEAR CHEMISTRY Progress Report, 1 Mar. 1981 - 28 Feb. 1982
G. R. Choppin 1981 23 p
(Contract DE-AS05-76ER-01797)
(DE81-030542; DOE/ER-01797/T1) Avail: NTIS HC A02/MF A01

Investigations of the properties of the actinide elements in aqueous solution are continued. Analogous and complementary studies of lanthanide cations were conducted also. Potentiometry, calorimetry, solvent extraction, and nuclear magnetic resonance were the principle techniques. Evaluation of the thermodynamic values of complexation with series of alkyl dicarboxylate ligands provided understanding of the ring size for chelated complexes of these metals. Five and six membered chelate rings form but unless other geometical features favor chelation, it does not seem to occur for ring sizes greater than seven. From a similar study of complexation with aromatic polycarboxylate ligands, transfer of negative charge through the pi system of the ligand enhanced the strength of complexation. Study of the PuO2(2)-bicarbonate system showed that two species formed in the solution. We assigned as these species PuO2(OH)

(HCO3)(+1) and PuO2(CO3)2(+2). In sea water, our results indicate that soluble Pu(VI) exists about equally as PuO2(OH)2 and PuO2 (OH)2(HCO3)(+1) with very little PuO2(CO3)2(+2). This reflects a substantial difference from U(VI), as the dominant form in sea water is UO2(CO3)(+2). A significant achievement was the automation of the titration calorimeter. This allows simpler, and more sensitive operation. Techniques for studying the redox behavior of Pu(VI) and Np(V) in the presence of organic complexing ligands were developed and initial studies begun. GRA

74 OPTICS

Includes light phenomena.

N82-16848*# McDonnell-Douglas Research Labs., St. Louis, Mo. Solid State Sciences Dept.
ADVANCED METHODS FOR PREPARATION AND CHARACTERIZATION OF INFRARED DETECTOR MATERIALS Interim Report, 5 Jul. 1980 - 30 Sep. 1981
S. L. Lehoczky and F. R. Szofran 30 Sep. 1981 40 p refs
(Contract NAS8-33107)
(NASA-CR-161949; MDC-Q0744) Avail: NTIS HC A03/MF A01 CSCL 20F

Differential thermal analysis data were obtained on mercury cadmium telluride alloys in order to establish the liquidus temperatures for the various alloy compositions. Preliminary theoretical analyses was performed to establish the ternary phase equilibrium parameters for the metal rich region of the phase diagram. Liquid-solid equilibrium parameters were determined for the pseudobinary alloy system. Phase equilibrium was calculated and Hg(l-x) Cd(x) Te alloys were directionally solidified from pseudobinary melts. Electrical resistivity and Hall coefficient measurements were obtained. A.R.H.

N82-16849*# Ball Aerospace Systems Div., Boulder, Colo.
DESIGN STUDY OF IMAGING TECHNIQUES FOR THE STARPROBE MISSION Final Report
M. Bottema 4 Sep. 1981 87 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955929)
(NASA-CR-168392; JPL-9950-602; F81-08) Avail: NTIS HC A05/MF A01 CSCL 20F

A 10 cm aperture, off-axis aplanatic gregorian telescope is investigated as a candidate instrument for imaging from Starprobe in the 115 nm to 900 nm wavelength range. Focal lengths of 300 cm (f/30) and 150 cm (f/15) are compared in terms of optical performance, compatibility with the Starprobe spacecraft and response to the thermal environment in a 20-hour time interval, centered on perihelion. Ultraviolet/visible imaging from Starprobe concluded should be technically feasible. A 10 cm aperture telescope with focal length close to 300 cm is recommended for further study. This instrument should be capable of a detector-limited angular resoluton of about 2 arc sec. The estimated overall dimensions should not exceed 105 cm by 40 cm by 25 cm and its mass be less than 28 kg. The recommended concept assumes solid blank ULE mirrors, a graphite-epoxy optical bench, and an aluminum thermal enclosure, covered with multilayer insulation. These materials must be carefully selected to minimize the risk of UV photopolymerization of contaminants at the mirror surfaces during observtions. N.W.

N82-16850# HTL Industries, Inc., Duarte, Calif. Advanced Technology Div.
TEST AND EVALUATION OF UV FIBER OPTICS FOR APPLICATION FOR AIRCRAFT FIRE DETECTOR SYSTEMS Final Report, 23 May 1980 - 23 Mar. 1981
Dayton, Ohio AFWAL Jun. 1981 58 p refs
(Contract F33615-80-C-2042; AF Proj. 3048)
(AD-A106129; AFWAL-TR-81-2049) Avail: NTIS HC A04/MF A01 CSCL 17/5

It was found that in the U.V. solar blind region, there are severe limitations on the field of view obtainable in Fiber Optic coupled systems. These restrictions are such as to make further consideration of the wide angle system concept unprofitable. This effectively limits the use of such systems in fire detection to applications where the precise location of a flame can be predicted. It is concluded that the performance of optical fibers in the U.V. solar blind wavelengths is such that the trade-off gains proposed in AFAPL-TR-78-84 cannot be realized in practice. Author (GRA)

N82-16851# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
TIME INTEGRATING OPTICAL SIGNAL PROCESSING Final Report, 1 Aug. 1980 - 31 Jul. 1981
Todd R. Bader, Peter Kellman, and Harry N. Shaver Jul. 1981 97 p refs
(Contract F49620-78-C-0102; AF Proj. 2305)
(AD-A106778; AFOSR-81-0700TR) Avail: NTIS HC A05/MF A01 CSCL 09/3

Optical signal processing architectures using time integration on the detector array provide a highly flexible, multipurpose, wideband, realtime processor. A key feature of the time integrating concept is the ability to perform very large time-bandwidth product processing operations on signals without having to store the entire time history of the signal as a spatial record. Further, these signal processing operations may be realized with either coherent or non-coherent optical systems. In the first phase of the program, a comprehensive treatment of time integrating acousto-optic signal processing was undertaken. This treatment includes a synthesis and evaluation of alternative architectures and a detailed statistical analysis of processor performance. New developments include the extension of one dimensional time integrating optical correlation to two dimensional processing, the concepts of interferometric signal processing techniques to complex computation. One and two dimensional complex signal processing algorithms have been developed for non-coherent optical realizations. Detailed analysis has been made for complex spectral analysis and ambiguity function processing. Complex computation using real correlation processing has been analyzed. GRA

N82-16852# Oregon Graduate Center for Study and Research, Beaverton. Dept. of Applied Physics and Electronic Science.
EFFECTS OF STRONG TURBULENCE ON SHORT WAVELENGTH LASER: EXPERIMENTAL DETERMINATION OF MEAN SQUARE WANDER ANGLE Final Report
C. M. McIntyre 15 Sep. 1981 47 p refs
(AD-A106776; AFOSR-81-0726TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The objective of this experimental study was to verify analytical work concerning some effects of strong turbulence on short wavelength lasers. In particular, the r.m.s. wander angle of a transmitted laser beam, as a function of integrated path turbulence has been shown to increase to a maximum and then to decrease towards a constant value that is the same order as the diffraction limited spot size of the aperture in very strong turbulence. This means that an active correction for wander angle, applied at the transmitter, although useful at low to moderate levels of turbulence, is ineffective in increasing power density on the target for high levels of integrated path turbulence. An experimental measurement of the r.m.s. wander angle of a transmitted laser beam vs. integrated path turbulence in a simulated atmospheric path has been completed and the results are in qualitative agreement with the theory. GRA

N82-16853# Singer-Kearfott, Little Falls, N. J. Kearfott Div.
FIBER OPTIC TRANSLATOR UNIT (FOTU), VOLUME 1 Final Report, 16 Jul. 1979 - 19 Dec. 1980
Mario Vojvodich and Bob Naydan Wright-Patterson AFB, Ohio AFWAL May 1981 87 p refs
(Contract F33615-79-C-1812; AF Proj. 7662)
(AD-A106131; AFWAL-TR-81-1039-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 09/5

The Fiber Optic Translator Unit (FOTU) provides bi-directional translation of wide dynamic range optical signals to and from wire-bus signals, while maintaining MIL-STD-1553B protocol and format. Bipolar, electrical Manchester waveforms are converted to unipolar Manchester type signals, and vice/versa; the FOTU circuitry is essentially transparent in both directions. GRA

N82-16854# T and E International, Inc., Bel Air, Md.
INFRARED EQUIPMENT, GENERAL Final Report

13 Oct. 1981 24 p refs Supersedes MTP-6-2-135
(Contract DAAD05-80-C-0128)
(AD-A106711; TECOM-TOP-6-2-135; MTP-6-2-135) Avail: NTIS HC A02/MF A01 CSCL 17/5

Outlines test procedures and methods for use in evaluating the performance of infrared equipment. Includes checklist and data collection sheets. Author (GRA)

N82-16855# Rome Air Development Center, Griffiss AFB, N.Y.
REDUCTION OF ANISOPLANATIC ERRORS
Donald W. Hanson Aug. 1981 78 p refs
(AD-A106689; RADC-TR-81-122) Avail: NTIS HC A05/MF A01 CSCL 20/6

The potential of reducing anisoplanatic errors in adaptive optical systems through the use of estimation theory is studied. Currently anisoplanatic errors place a fundamental limit on the performance of adaptive optical systems. Due to the ill behaved nature of the random processes involved, the estimation procedure is formulated in terms of the structure and hyperstructure functions. These functions are widely used in the literature dealing with turbulence and optical propagation through turbulence. A particular turbulence profile is chosen to evaluate the performance of the estimation procedure. A reasonable reduction in the anisoplanatic error is obtained through use of the estimation procedure. Only signals which are currently available in adaptive optical systems are required to implement the estimation procedure, no a priori knowledge is required. Author (GRA)

N82-16856# Hughes Research Labs., Malibu, Calif.
REAL-TIME IMPLEMENTATION OF NONLINEAR PROCESSING FUNCTIONS Final Technical Report, 15 Apr. 1977 - 14 Apr. 1981
Bernard H. Soffer Aug. 1981 61 p refs
(Contract F49620-77-C-0080; AF Proj. 2305)
(AD-A106773; AFOSR-81-0710TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

Optical data processing has not achieved its potential of increased capacity and speed compared wth conventional electronic techniques primarily for lack of a practical real-time image modulator and because optical techniques have been almost exclusively limited to linear operations. The research outlined in this report of a four year research program attacks these issues by studying the implementation of real-time nonlinear parallel-processing techniques. The various implementations studied all employ real-time liquid-crystal light valves. These spatial light modulators were developed and specially modified for these tasks by Hughes Research Laboratories. One approach we have investigated was to modify and characterize the standard twisted-nematic liquid-crystal devices and then to use them in a coherent optical data-processing apparatus using halftone masks custom designed at the University of Southern California. With the halftone mask technique, we have demonstrated logarithmic nonlinear transformation, allowing us to separate multiplicative images and perform homomorphic filtering. In addition, a novel analog-to-digital converter, based on a modified purebirefringence liquid-crystal light valve, was developed and demonstrated. It can perform parallel processing using i coherent light, and it promises high data throughput rates. Furthermore, a novel device that converts local light variations to local liquid-crystal phase grating period variations has been fabricated and was evaluated and improved. GRA

N82-16857# RCA Labs., Princeton, N. J. Solid State Devices Lab.
FABRICATION OF HETEROJUNCTION LEDS FOR OPERATION AT 1.3 MICROMETERS Final Technical Report, 15 Jun. 1979 - 14 Jun. 1980
G. H. Olsen, F. Z. Hawrylo, D. J. Channin, D. Botez, and M. Ettenberg Sep. 1981 51 p refs
(Contract F19628-79-C-0115; AF Proj. 4600)
(AD-A107730; PRRL-80-CR-35; RADC-TR-81-199) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report describes research undertaken to study and optimize the device properties of 1.3-micron InGaAsP edge-emitting LEDs fabricated by both vapor-phase epitaxy (VPE) and liquid-phase epitaxy (LPE). Edge-emitting LEDs have been prepared with both growth methods with a combination of properties rivaling the best reported to date. In the previous final report (RADC-TR-80-110) details of the VPE growth process were presented. Details of the LPE growth process are presented here. The LED efficiency of LPE devices was found to increase with decreasing cavity thickness. A value over 1% was measured with a 1000 lambda. Contact stripe width and coupling technique were also varied to achieve maximum power into an optical fiber. The best coupling was obtained with a 12-micron-wide contact stripe. Significantly better coupling was also achieved with a balled, rather than cleaved, end fiber. More than twice the power could be coupled into a 100-micron core diameter fiber, as compared to a 50-micron core fiber. The temperature dependence of LED emission was also measured for both VPE and LPE devices. LED efficiency dropped over 30% between 20 and 70 C, while an emission wavelength shift of 5 to 6 lambda/C was observed over the same temperature range. GRA

N82-16858# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FABRICATION OF METAL MIRRORS FOR FAR-INFRARED WAVELENGTHS
Gerald F. Dionne 7 Oct. 1981 14 p refs
(Contract F19628-80-C-0002)
(AD-A107898; TR-588; ESD-TR-81-282) Avail: NTIS HC A02/MF A01 CSCL 20/6

A simple machining procedure has been applied successfully to produce metal mirrors suitable for far-infrared wavelengths. Ninety-degree off-axis paraboloidal or ellipsoidal mirror sections may be cut from brass or aluminum by means of a series of pre-determined increments on a conventional laboratory lathe. Paraboloidal mirrors with low f-numbers (f/2) have been used with good results as part of the collecting optics of a far-infrared heterodyne receiver. Author (GRA)

N82-16859# Geo-Atmospherics Corp., Lincoln, Mass.
MODELS OF WEATHER ENVIRONMENTS ADVERSE TO ELECTRO-OPTICAL SYSTEMS
Wayne D. Mount and B. Richard Fow White Sands Missile Range, N. Mex. Army Electronics Research and Development Command Sep. 1981 111 p refs
(Contract DAAD07-80-C-0047; DA Proj. 1L1-61102-B5-3A)
(AD-A107637; ERADCOM/ASL-CR-81-0047-1) Avail: NTIS HC A06/MF A01 CSCL 20/6

Weather models were developed to depict hour by hour variations of scattering media, the atmosphere, important to Army electro-optical system performance. Dynamic models are presented for specifying particle size distributions in horizontal and vertical directions for haze, fog, cloud, and rain conditions given only routinely available meteorological data. Case studies show that these models perform well individually and when used together. This effort should be viewed as the first step in developing dynamic models that are responsive to observed and forecast weather changes. The models needed to be applied, tested, modified, and improved. Author (GRA)

N82-16860# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANGULAR INTERFEROMETRY-RESOLUTION ENHANCEMENT USING HALF-WAVE PLATES M.S. Thesis - MIT
George B. Hept Feb. 1981 49 p refs
(AD-A107974; AFIT-CI-81-59T) Avail: NTIS HC A03/MF A01 CSCL 14/2

Draper Laboratory is using an interferometer to monitor the rotation of an actively-controlled test platform to .01 arcsec. The resolution of the interferometer needed to be doubled in order to achieve this accuracy goal. The resolution of an interferometer can be doubled by sending the beam back to its target a second time. A method for doing this, analogous to the quarter-wave plate/plane-mirror doubling scheme commonly used in linear interferometry, was designed to double the resolution of the angular interferometer. This method used a combination of half-wave plates and retroreflectors to produce the doubling effect. Some simple, small-scale tests proved that this alternate method worked and that the use of the plates caused no discernible error. A full-scale test on Draper Laboratory test platform showed that doubling the angular resolution was practical and that .01 arcsec accuracy could be achieved. Author (GRA)

N82-16861# Brookhaven National Lab., Upton, N. Y.
PROGRESS AND PROSPECTS AT THE NATIONAL

SYNCHROTRON LIGHT SOURCE (NSLS)
Malcolm R. Howells Jul. 1981 20 p refs Presented at the 2nd Natl. Conf. on Synchrotron Radiation Instrumentation, Ithaca, N.Y., 15-17 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE81-030738; BNL-29985; CONF-810750-6) Avail: NTIS HC A02/MF A01

The National Synchrotron Light Source (NSLS) project is discussed from inception until the present. The commencement and motivation for the program are considered from the viewpoint of the needs of various experiments and the concepts of the Basic Source is introduced. The Basic Source has high brightness and tunability within the ranges 0 to 0.3 keV and 3 to 20 keV. The inclusion of tunability implies the use of monochromators and the role of these is discussed. The Basic Source is important because it satisfies a very large proportion of users. The strategy of NSLS in providing a good Basic Source and special devices (monochromators and wigglers) to allow coverage of the energy ranges outside those of the Basic Source is described. The NSLS facility will be completed within 2 to 3 months of its scheduled timescale and within its budget. DOE

N82-16111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN M-ARY COHERENT OPTICAL RECEIVER FOR THE FREE-SPACE CHANNEL
V. A. Vilnrotter *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 60-66 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20F

N82-16117*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE 2.5-BIT/DETECTED PHOTON DEMONSTRATION PROGRAM: DESCRIPTION, ANALYSIS AND PHASE 1 RESULTS
J. R. Lesh, J. Katz, H. H. Tan, and D. Zwillinger *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 115-132 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 20F

N82-16998# Astronomische Gesellschaft, Hamburg (West Germany).
THE NEW OPTICAL (300 nm LESS THAN LAMBDA LAMBDA LESS THAN 1000 nm) ESO PHOTOMETER
G. F. O. Schnur *In its* Astron. Soc. Inform. No. 52 1981 p 128-130 (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-17048*# James Madison Univ., Harrisonburg, Va. Dept. of Mathematics and Computer Science.
TOLERANCE ANALYSIS OF OPTICAL TELESCOPES USING COHERENT ADDITION OF WAVEFRONT ERRORS
John W. Davenport *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Feb. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20F

N82-17060*# South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A STUDY OF OPTICALLY CONTACTED QUARTZ AT CRYOGENIC TEMPERATURES
Linda L. Payne *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-16862# Mission Research Corp., Alexandria, Va.
EXPERIMENTS ON THE INTERACTION OF HIGHPOWER MICROWAVES WITH AIR Final Report, 4 Apr. 1980 - 4 Jun. 1981
W. M. Bollen, R. K. Parker, and W. M. Black Jul. 1981 37 p refs
(Contract N00173-80-C-0126)
(AD-A106390; MRC/WDC-R-015) Avail: NTIS HC A03/MF A01 CSCL 20/9

The physics of gas breakdown for large collision frequency, nu/omega > 1, is being pursued at the Naval Research Laboratory. The hybrid inverted coaxial magnetron, 500 MW, 3.2 Ghz, 30 ns pulse width, allows investigation of gas breakdown in the high nu/omega regime. The 35 Ghz gyrotron, 150 KW, 300 pps, allows investigation in a moderate nu/omega regime. Large gas breakdown plasma densities have been measured, n approx. 100 n sub c. Spectral measurements have been made showing only excitation of molecular bands. Preliminary propagation experiments have also been performed. Author (GRA)

N82-16863# Air Force Weapons Lab., Kirtland AFB, N. Mex.
PARAMETRIC CONSIDERATIONS FOR INDUCTIVELY DRIVEN PLASMA IMPLOSIONS Final Report
Robert E. Reinovsky and D. L. Smith Jan. 1981 39 p
(AF Proj. 1209)
(AD-A106679; AFWL-TR-79-179) Avail: NTIS HC A03/MF A01 CSCL 20/9

This report explores the system aspects of driving implosion loads with inductive sources. High-speed plasma implosions represent an attractive approach to the production of an intense radiation source for use in an X-ray Effects Simulator. The nature of the implosion and the energy levels required for an X-ray Simulator make the use of inductive energy sources for driving the implosion attractive from the standpoints of both physics and economics. Parametric analysis and circuit calculations are employed to investigate the interrelation of circuit parameters (storage and load inductances), load parameters (mass, size, and speed), and switch parameters (resistance and rise time). The results show that 25 percent inductive to kinetic efficiency is attainable with only moderate requirements placed upon the switch performance. The status of current opening switch development is reviewed, and meets the minimum requirements predicted by the analysis. Author (GRA)

N82-16864# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
TILT AND SHIFT MODE STABILITY WITH LINE TYING Interim Report
J. M. Finn (Maryland Univ., College Park) and A. Reiman 23 Oct. 1981 57 p refs Sponsored in part by DOE
(AD-A106228; NRL-MR-4610) Avail: NTIS HC A04/MF A01 CSCL 20/9

Magnetohydrodynamic stability of force free spheromak plasmas to n=1 free boundary tilt and radial shift modes is studied. The exterior region of open field lines is treated either as a conducting plasma or as a vacuum. In the former case the effect of line tying of the open field lines is present and is found to improve stability greatly. The equilibria which have optimum stability properties to the tilt and shift modes have a length to diameter ratio of 0.6, and can be stable with conducting walls at a relatively large distance. Author (GRA)

N82-16865# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
ITERATIVE ABEL INVERSION OF OPTICALLY THICK, CYLINDRICALLY SYMMETRIC RADIATION SOURCES
Stephen J. Young 21 Aug. 1981 11 p refs
(Contract F04701-80-C-0081)
(AD-A106239; TR-0081(6623)-3; SD-TR-81-43) Avail: NTIS HC A02/MF A01 CSCL 20/9

An inversion algorithm for obtaining the radial emission and absorption coefficients of a cylindrically symmetric radiation source from transverse profiles of monochromatic radiance and absorptance is described and compared with the algorithm of Elder et al. It is shown that the present method converges to the correct solution, whereas the Elder et al method does not.
Author (GRA)

N82-16866# Sandia Labs., Albuquerque, N. Mex. Nondestructive Testing Technology Div.
MEASUREMENT OF SURFACE SHAPE OF IMPLODING

HOLLOW PLASMA LINERS

B. D. Hansche 1981 6 p ref Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981

(Contract DE-AC04-76DP-00789)
(DE81-030996; SAND-81-1503C; CONF-811113-12) Avail: NTIS HC A02/MF A01

It is noted that imploding hollow plasma liners tend to have imperfections such as wrinkles, and measurement of the size and shape of these imperfections is important both for prediction of the performance of a particular liner, and for quantitatively studying the fabrication process, in an attempt to minimize the imperfections. An optical technique which maps the surface shape of some of the liners is described. DOE

N82-16867# California Univ., Livermore. Lawrence Livermore Lab.

NUMERICAL SIMULATION OF THE BETA 2 EXPERIMENT

D. E. Shumaker, J. K. Boyd, B. McNamara, and W. C. Turner Oct. 1981 16 p refs Presented at the 23rd Ann. Phys. Soc. Meeting, New York, 12 Oct. 1981 Submitted for publication

(Contract W-7405-eng-48)
(DE81-030884; UCRL-85579) Avail: NTIS HC A02/MF A01

The transport code FRT which is a 1-1/2-D transport equilibrium code for an axisymmetric plasma was used to simulate the decay of the plasma and magnetic fields of the Beta II experiment. A comparison is made between the experimentally determined decay times for the magnetic fields and particle confinement times and the computed decay times. It is found that 1% oxygen impurity is enough to champ the electron temperature below the radiation barrier, which is in agreement with the experiment. DOE

N82-16868# General Atomic Co., San Diego, Calif.

EXPANDED BOUNDARY DIVERTOR EXPERIMENTS IN DOUBLET 3

J. C. Wesley, N. H. Brooks, J. C. DeBoo, J. S. deGrassie, R. J. Groebner, C. L. Hsieh, M. A. Mahdavi, N. Ohyabu, R. D. Stambaugh, and T. Taylor Jul. 1981 24 p refs Presented at the IAEA Tech. Comm. Meeting on Divertors and Impurity Control in Tokamaks, Garching, W. Germany, 6-10 Jul. 1981

(Contract DE-AT03-76ET-51011; GEN. ATOMIC PROJ. 3344)
(DE81-030399; GA-A-16445; CONF-810745-2) Avail: NTIS HC A02/MF A01

The expanded boundary divertor configuration establishes a divertor plasma characterized by high density and low temperature and produces hydrogen pressures below the divertor region up to 0.001 Torr. The divertor density was found to rise nonlinearly with the main plasma density anti n/sub e/, scaling approximately as anti n/sub e/3. This behavior is described by a simple one dimensional parallel heat flow model that neglects radiation and particle transport except near the target plate (wall). The model further predicts that the divertor temperature scales as anti n/sub e/sub 2. DOE

N82-16869# Hanford Engineering Development Lab., Richland, Wash.

FUSION-REACTOR BLANKET AND COOLANT MATERIAL COMPATIBILITY

D. W. Jeppson and R. F. Keough 1981 7 p ref Presented at the Fusion Reactor Mater. Meeting, Seattle, 9-10 Aug. 1981

(Contract DE-AC14-76FF-02170)
(PB81-030018; HEDL-SA-2355-FP; CONF-810831-56) Avail: NTIS HC A02/MF A01

Fusion reactor blanket and coolant compatibility tests are conducted to aid in the selection and design of safe blanket and coolant systems for fusion reactors. Scoping compatibility tests to date are reported for blanket material and water interactions at near operating temperatures. These tests indicate the quantitative hydrogen release, the maximum temperature and pressures produced, and the rates of interactions for selected blanket materials. DOE

N82-16870# Sandia Labs., Albuquerque, N. Mex.

LIGHT ION BEAMS AS THE DRIVER FOR INERTIAL-CONFINEMENT FUSION

K. W. Bieg and G. W. Kuswa 1981 23 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif. 2-6 Nov. 1981

(Contract DE-AC04-76DP-00789)
(DE81-030116; SAND-81-1508C; CONF-811113-2) Avail: NTIS HC A02/MF A01

A brief description of and recent results in the areas of pulse power systems, ion generation and focusing, target irradiation experiments and light ion driven fusion reactor concepts are given. Several areas of development in which improved materials are either required, or could greatly influence progress toward fusion are described. DOE

N82-16871# Westinghouse Electric Corp., Pittsburgh, Pa. Fusion Power System Dept.

COMPACT COMMERCIAL TOKAMAK REACTOR (CCTR): A CONCEPT FOR A 500-MWe COMMERCIAL-TOKAMAK FUSION SYSTEM

Thomas J. Gillen (Pennsylvania State Univ., University Park) Nov. 1980 70 p refs

(Contract DE-AC02-77ET-51010)
(DE81-030406; WFPS-TME-81-015) Avail: NTIS HC A04/MF A01

A detailed set of self-consistent parameters and cost for the conceptual design of a compact commercial Tokamak reactor (CCTR) is given. Several of the basic design features include an ignited plasma with a major radius of 4.9 m and minor radius of 1.4 m; a net electrical output of 500 MW; a borated-water-cooled, stainless steel shield; and a toroidal field of 12 T at the coil. The design which utilizes a computer code for the costing and sizing of D-T burning Tokamaks mainly provides the sizes and geometries associated with the definition of the main component features for which a detailed engineering design can be effectively undertaken. Design study alternatives, including a neutral beam driven design, option, a design option with a toroidal field of 13 T at the coil, and a tungsten-shielded option are considered for the CCTR. Also included is the conceptual design of a computer fusion engineering device. DOE

N82-16872# Brookhaven National Lab., Upton, N. Y.

SEARCH FOR PROMETHIUM-LIKE GOLD LINES AND OTHER TRANSITIONS OF INTEREST TO FUSION RESEARCH

B. M. Johnson, K. W. Jones, T. H. Kruse (Rutgers Univ., Piscataway, N.J.), L. J. Curtis, and D. G. Ellis 1981 20 p refs Presented at the 6th Intern. Conf. on Fast Ion Beam Spectry., Quebec, Canada, 17-20 Aug. 1981 Prepared in cooperation with Toledo Univ.

(Contracts DE-AC02-76CH-00016; DE-AS05-80ER-10676)
(DE81-029917; BNL-29948; CONF-810868-2) Avail: NTIS HC A02/MF A01

Extreme ultraviolet spectra in the range lambda = 13 to 40 rm were measured for foil excited gold ions at 31 to 238 MeV. Data was recorded at the higher energies to extend and to complement previous measurements and at the lowest energy to see if the recently predicted 5s - 5p resonance lines in the Pm-like ion, Au XIX, could be seen in beam foil excitation. The experimental results are presented, previous beam foil measurements are reviewed, and the contributions and relations to fusion research are discussed. DOE

N82-16873# Brookhaven National Lab., Upton, N. Y.

FUSION PLASMA CONTROL USING TRAIL: A NONDAMAGEABLE LIMITER

W. S. Yu, James R. Powell, John A. Fillo, and John L. Usher 1981 6 p refs Presented at the ANS Winter Meeting, San Francisco, 29 Nov. 1981

(Contract DE-AC02-76CH-00016)
(DE81-030825; BNL-30002; CONF-811103-41) Avail: NTIS HC A02/MF A01

An attractive new limiter system is described, termed TRAIL (Tokamak Rail Gun Limiter), which can inject streams of pellets into the plasma to: (a) define the plasma boundary, (b) absorb plasma disruption energy, and (c) control plasma temperature profiles. Using EM (Electromagnetic) guns now being developed for military applications, particles can be injected at velocities in the range of meters to several kilometers per second. Transient heat transfer analyses are presented for various pellet sizes (0.5 to 1.5 cm diam), heat fluxes (5,000 to 200,000 W/sq cm), compositions (Al, Cu, C, Mo, and Li) and heat pulse length (2.5 to 50 ms). DOE

N82-16874# Oak Ridge National Lab., Tenn.
HIGH-BETA STUDIES WITH BEAM-HEATED, NON-CIRCULAR PLASMAS IN ISX-B
E. A. Lazarus, S. C. Bates, C. E. Bush, B. A. Carreras, J. L. Dunlap, G. R. Dyer, P. H. Edmonds, J. H. Harris, H. C. Howe, and D. Hutchinson 1981 5 p refs Presented at the 10th European Conf. on Controlled Fusion and Plasma Phys., Moscow, 14 Sep. 1981
(Contract W-7405-eng-26)
(DE81-032003; CONF-810906-10) Avail: NTIS HC A02/MF A01

Some preliminary results of high beta studies on ISX-B for mildly D shaped discharges are described. This modest size Tokamak is equipped with two tangantially aligned neutral beam injectors giving a total power up to 3 MW. The poloidal coil system allows choice of plasma boundary shapes from circular to elongated (kappa = or approximately 1.8), with D, elliptical, or inverse D cross sections. The noncircular work discussed here is for kappa = approximately 1.5. DOE

N82-16875# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN OF FIRST WALLS AND BEAM DUMPS FOR TANDEM MIRROR EXPERIMENT UPGRADE
R. P. Drake, D. D. Lang, A. L. Hunt, W. L. Pickles, T. C. Simonen, T. P. Stack, K. L. Wilson, M. I. Baskes, L. G. Haggmark, and M. E. Malinowski 15 Sep. 1981 16 p refs Presented at the 28th Natl. Symp. of the Am. Vacuum Soc., Anaheim, Calif., 2-6 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030888; UCRL-86195; CONF-811113-7) Avail: NTIS HC A02/MF A01

Neutral reflux from the first walls and beam dumps of the Tandem Mirror Experiment (TMX) Upgrade could erode the neutral-beam-fueled, end-cell plasma or cool the neutral-beam-heated, central-cell plasma. To allow the TMX Upgrade to meet its design parameters, the neutral reflux to the plasma must be much less than the fluxes of both charge-exchange neutral products to the first walls and transmitted neutral-beam atoms to the beam dumps. To achieve this, the intent is to evaporate titanium as a getter on the first wall and install vanadium-foil beam dumps. The vanadium beam dumps will be heated by the neutral beam during the shot, releasing most of the implanted hydrogen as they cool radiatively after the shot. The deposited titanium will be thick enough to retain the implanted charge-exchange neutral products. The design of these components, estimates of their performance, and comparisons of their performance to the needs of TMX Upgrade are described. DOE

N82-16876# California Univ., Livermore. Lawrence Livermore Lab.
NEUTRAL-BEAM SYSTEMS FOR MAGNETIC-FUSION REACTORS
Joel H. Fink (Westinghouse Electric Corp., Pittsburgh) 10 Aug. 1981 23 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3-6 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-027940; UCRL-86196; CONF-811113-1) Avail: NTIS HC A02/MF A01

Neutral beams for magnetic fusion reactors are investigated. To optimize their performance to establish specific goals for component development, systematic analysis of the beamlines is essential. Three ion source characteristics are discussed: arc-cathode life, gas efficiency, and beam divergence, and their significance in a high-energy neutral beam system is evaluated. DOE

N82-16877# Oak Ridge National Lab., Tenn. Fusion Energy Div.
AMBIPOLAR POTENTIAL FORMATION AND CONTROL IN BUMPY TORI AND MIRRORS: PROCEEDINGS OF WORKSHOP
Nermin A. Uckan, ed. Sep. 1981 459 p refs Proceedings of conf. held in Oak Ridge, Tenn., 11-12 May 1981
(CONF-810511) Avail: NTIS HC A20/MF A01

The status of experimental and theoretical understanding of the role played by the ambipolar potentials in tandem mirrors and bumpy toruses was evaluated, and critical processes influencing the formation and control of the ambipolar potentials in these devices identified. For individual titles, see N82-16878 through N82-16899.

N82-16878# Applied Microwave Plasma Concepts, Encinitas, Calif.
MULTI-SPECIES AMBIPOLAR PHENOMENA IN THE ELMO BUMPY TORUS
G. E. Guest *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 23-36 refs (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

An earlier, heuristic version of neoclassical transport theory suggested a plausible interpretation of empirical results from ELMO Bumpy Torus-I (EBT-I), such as the relation between electron temperature and density, the ambipolar electric field, and the distribution of ion energies in a two-species plasma consisting of equal concentrations of electrons and protons. This picture is easily generalized to include more than one species of ions, a situation which may arise experimentally by virtue of impurities or deliberate admixture of gases. The limiting case of a small relative concentration of a second species of ions is discussed and illustrated with plasma parameters typical of EBT-I/S. The dominant transport process for the trace ion group is assumed to be the rapid drift surface diffusion that results if the ion energy approaches the transitional energy, at which the net azimuthal drift velocity vanishes, W sub t approximately = qE sub r R sub c. Autor

N82-16879# Rensselaer Polytechnic Inst., Troy, N. Y. Plasma Diagnostic Group.
EXPERIMENTAL MEASUREMENT OF PLASMA SPACE POTENTIAL
R. L. Hickok *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 37-62 Sponsored by DOE (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

The use of heavy ion beam probes to measure the potential in the central cell of the Tandem Mirror Experiment (TMX) and the ELMO Bumpy Torus - I/S is described. Sources of error are described and the need for careful calibration stressed. The basic operation of the heavy ion beam probe is described. The determination of space resolution, secondary ion energy measurement, time resolution, sensitivity and maximization of the signal to noise ratio, uncertainties in beam trajectories, three dimensional effects and the need for careful alignment of the complete beam system, and perturbation of the plasma caused by beam probing are discussed. J.D.H.

N82-16880# California Univ., Livermore. Lawrence Livermore Lab.
AMBIPOLAR POTENTIAL FORMATION IN TMX
D. L. Correll, S. L. Allen, T. A. Casper, J. F. Clauser, P. Coakley (Iowa Univ., Iowa City), F. H. Coensgen, W. Condit, W. C. Cummins, J. C. Davis, R. P. Drake et al *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 63-83 refs Prepared in cooperation with Rensselaer Polytechnic Inst. and Johns Hopkins Univ., Baltimore, Md. (For primary document see N82-16877 07-75)
(Contract W-7405-eng-48)
Avail: NTIS HC A20/MF A01

Experimental data from the Tandem Mirror Experiment (TMX) on ambipolar potential control and on the accompanying electrostatic confinement are reported. Results on the radial dependence of the central cell confining potential are given. Radial and axial particle losses as well as scaling of the central cell axial confinement are discussed. Author

N82-16881# Rensselaer Polytechnic Inst., Troy, N. Y.
SPACE POTENTIAL MEASUREMENTS IN THE CENTRAL CELL OF TMX
G. A. Hallock, R. L. Hickok, R. S. Hornady (Lawrence Livermore National Lab.), W. C. Jennings, and K. Saadatmand *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 85-103 refs (For primary document see N82-16877 07-75)
(Contract W-7405-eng-48)

Avail: NTIS HC A20/MF A01

A heavy ion beam probe has provided detailed spatial and temporal measurements of the Tandem Mirror Experiment (TMX) central cell space potential (phi sub e). With gas box fueling of the plasma at typical feed rates (radius of the limiter = 38 cm), the potential is strongly parabolic to at least 25 cm with phi = phi sub mzx (1 - r/32 cm) sq providing a good fit and 300 < phi sub max < 450 volts depending on machine conditions such as neutral beam heating current. With puffer fueling the central cell potential remains relatively flat to at least 30 cm. Author

N82-16882# Wisconsin Univ. - Madison. Dept. of Engineering.

POTENTIAL MEASUREMENTS IN PHAEDRUS - WISCONSIN'S TANDEM MIRROR

Robert A. Breun, Steve Golovato, Brian McVey, Art Molvik, Donna Smatlak, and Larry Yujiri *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 105-122 Prepared in cooperation with Lawrence Livermore National Lab. (For primary document see N82-16877 07-75)

Avail: NTIS HC A20/MF A01

First, axial, and radial potential measurements made on an afterglow plasma generated by on axis stream guns, plug ion cyclotron resonance heating (ICRH), and central cell gas puffing in the Phaedrus tandem mirror are described. For this mode, the radio frequency (RF) and stream guns are turned off at the same time. Initial potential and plasma parameter measurements on the RF sustained operation mode are illustrated. Here, the ICRH in the plugs is left on after gun turn-off and the plug density and diamagnetism are sustained for up to 1 ms (e - folding time). A near tandem mirror configuration is maintained without neutral beams. A computer plot of the magnetic field coil setting and the on axis magnetic field strength is presented. Plasma parameters are listed. J.D.H.

N82-16883# Rensselaer Polytechnic Inst., Troy, N. Y. Plasma Dynamics Lab.

SPACE POTENTIAL MEASUREMENTS ON EBT

K. A. Connor, L. Solensten, F. M. Bieniosek, and R. L. Hickok *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 125-154 refs (For primary document see N82-16877 07-75)

(Contract W-7405-eng-48)

Avail: NTIS HC A20/MF A01

Heavy ion beam probe measurements of the ambipolar potential in the midplane of a single mirror section of the ELMO bumpy torus are analyzed. Measurements were made under all standard operating modes possible. The basic structure of the measured potential is presented. Particular emphasis is placed on the most pronounced features of the profiles and how they relate to operating conditions. J.D.H.

N82-16884# Nagoya Univ. (Japan). Inst. of Plasma Physics.

POTENTIAL FORMATION IN NAGOYA BUMPY TORUS

H. Iguchi, F. M. Bieniosek (Rensselaer Polytechnic Inst.), and K. Takasugi *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 155-166 refs (For primary document see N82-16877 07-75)

Avail: NTIS HC A20/MF A01

Space potential profiles in the Nagoya Bumpy Torus were measured with a heavy ion beam probe. Potassium and rubidium ion beams over an energy range of 3 - 15 kV were used to measure the potential with a spatial resolution of about 1 cm. Experiments performed at several different magnetic fields, especially at 1.8 kG (SR mode) and 3.2 (FR mode) are described. Measurements in typical T mode operation show a positive potential in the core plasma of about 200 V in both SR and FR modes. Varying the field correction loop current changes the core potential by + or - 50 V but the potential remains positive. The difference between the space potential and the floating potential measured by a Langmuir probe is 100 - 150 V, which is a few times the electron temperature of the core plasma. The effect on space potential of additional heating at 10.5 GHz was also investigated. Measurements of the plasma potential in the M mode show that the potential oscillates on a time-scale of 6 - 10 msec over a range of several kilvolts and these oscillations are correlated with oscillations in < n sub e 1 >. J.D.H.

N82-16885# Oak Ridge National Lab., Tenn.

ALUMINUM IMPURITY IONS AND THE AMBIPOLAR POTENTIAL IN EBT

R. K. Richards and E. F. Jaeger *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 167-182 ref (For primary document see N82-16877 07-75)

(Contract W-7405-eng-26)

Avail: NTIS HC A20/MF A01

Experimental evidence of a correlation between the electric potential and aluminum impurities in the ELMO bumpy torus (EBT) was investigated. This correlation is observed in the relation between the temperature of the highest aluminum charge state and the potential well depth. The aluminum temperature is determined for each charge state by measuring the Doppler broadening of a characteristic spectral line. Temperature as large as 650 eV have been found for Al(+3). Aluminum densities are derived by measuring the brightness of spectral lines with an absolutely calibrated spectrometer. The particle confinement time for the aluminum ions is determined by comparing the ratios of aluminum ion densities. Values for the aluminum confinement times are smaller than the electron confinement time by several orders of magnitude. Short lifetime suggests a large particle flux of aluminum and the formation of an ambipolar potential as a consequence. Author

N82-16886# Oak Ridge National Lab., Tenn.

EBT TRANSPORT AND AMBIPOLAR POTENTIAL FORMATION WITH RAPID LOSS OF HIGH ENERGY IMPURITY IONS

E. F. Jweger, R. K. Richards, and C. L. Hedrick *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 183-200 refs (For primary document see N82-16877 07-75)

(Contract W-7405-eng-26)

Avail: NTIS HC A20/MF A01

Density profiles for neutral impurity atoms and impurity ions of a single charge state are calculated as functions of radius in a 1 1/2 D transport calculation for the ELMO bumpy torus (EBT) toroidal plasma. Ad hoc energies and transport rates are assumed for the impurity ions consistent with spectroscopic measurement. Ambipolar transport rates are rederived to include impurity transport in the flux of positive particles, and the electric field is computed self-consistently. Steady state solutions show potential well depths on the order of the impurity ion temperature divided by its charge. Also, due to the large gyroradius of the impurity ions, viscosity limits shear in the poloidal drift velocity. Thus, potential profiles tend to be more parabolic, and the plasma rotates more nearly as a rigid body than would be expected from simple neoclassical theory with no impurities present. J.D.H.

N82-16887# Oak Ridge National Lab., Tenn.

FIELD ERRORS IN EBT AND THEIR EFFECTS ON THE AMBIPOLAR POTENTIAL

T. Uckan, F. M. Bieniosek, and L. Solensten *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 205-232 refs (For primary document see N82-16877 07-75)

(Contract W-7405-eng-26)

Avail: NTIS HC A20/MF A01

Because the ELMO Bumpy Torus (EBT) is a closed field line device, it is very sensitive to small magnetic field asymmetries. If the inherent error field of the device is large enough, it causes: a distortion of the poloidal symmetry of the potential profile and even a total disappearance of the ambipolar potential well, leading in turn to a deterioration of the plasma confinement parameters; the establishment of a toroidal current and, therefore, enhancement of fluctuations; and an opening of the confined closed drift surfaces that increases particle diffusion. The critical error field is estimated. For EBT-I/S the critical error field is comparable to the inherent field error of the device. Externally, about the same order of magnetic field correction is applied by two pairs of current loops in order to cancel the error field and reduce the toroidal current. The cancellation of the toroidal current provides better confinement parameters and the density fluctuations are reduced. J.D.H.

N82-16888# Oak Ridge National Lab., Tenn.
AMBIPOLAR POTENTIAL AND ITS EFFECTS ON THE CONFINEMENT PARAMETERS OF THE EBT PLASMA
T. Uckan, R. J. Colchin, W. A. Davis, G. R. Haste, D. L. Hillis, and L. Solensten (Rensselaer Polytechnic Inst.) *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 233-266 refs (For primary document see N82-16877 07-75)
(Contract W-7405-eng-26)
Avail: NTIS HC A20/MF A01

The microwave heating power the neutral gas pressure and the ambipolar potential well were used in transport modeling to predict the scaling of the density and of the electron and ion temperatures with these quantities. The scaling calculations are based on neoclassical theory of transport coefficients and experimental observations. A quadratic potential profile and almost flat density and electron temperature profiles were assumed. However, to satisfy the ambipolarity condition, the ion temperature profile was retained. Experimentally, the electrons are observed to be in the collisionless regime and the ions have a non-Maxwellian distribution, transport coefficients developed by Spong, are employed. The ambipolarity condition and the particle and energy balance equations can be satisfied by modeling the experimentally observed potential well and ion tail. The temperature and density scalings obtained show qualitative agreement between this calculation and experimental observations. Results of this model are presented for typical EBT-I/S operations.
A.R.H.

N82-16889# Oak Ridge National Lab., Tenn.
POWER REQUIREMENTS FOR ION TAIL FORMATION IN EBT
J. S. Tolliver, E. F. Jaeger, and C. L. Hedrick *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 267-276 refs (For primary document see N82-16877 07-75)
(Contract W-7405-eng-26)
Avail: NTIS HC A20/MF A01

Experimental evidence suggests the possible presence of an enhanced high energy tail on the ion distribution function, and a simple theoretical analysis indicates that an ion tail may be a major contributor to neoclassical losses which in turn influence the ambipolar potential. In order to study these effects, a kinetic model for neoclassical transport is developed using a Fokker-Planck collision operator and assuming isotropic electron and ion velocity distributions. Three coupled nonlinear integrodifferential equations are solved numerically. The solution shows a non-Maxwellian lowest order ion distribution function. This non-Maxwellian solution leads to higher core ion temperatures and larger ion diffusion rates than those obtained when a Maxwellian distribution is assumed. If the ion tail is further enhanced by a small amount of ad hoc heating, even higher core temperatures and loss rates are obtained. Author

N82-16890# Oak Ridge National Lab., Tenn. Computer Sciences Dept.
EFFECTS OF FLUCTUATING ELECTRIC FIELDS ON HYDROGEN AND IMPURITY IONS IN EBT
L. W. Owen *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 277-292 refs (For primary document see N82-16877 07-75)
(Contract W-7405-eng-26)
Avail: NTIS HC A20/MF A01

The effects of fluctuating poloidal electric fields on the orbits and on the heating and loss rates of ions and impurities in EBT are examined. The equations of motion for particles confined to a sector midplane are numerically integrated to yield the temporal behavior of the velocity and position coordinates in the presence of the vacuum magnetic field, a realistic steady state ambipolar electric field, and the sinusoidally varying electric field of a wave propagating in the poloidal direction. It is shown that a wave of modest amplitude, and frequency comparable to typical fluctuation frequencies (10-150-KHz) measured in EBT, can lead to large excursions in the kinetic energy and radial position of the hydrogen or impurity ion. The possible relevance of the results of these calculations to the behavior of impurity ions as functions of the mass, charge state, fluctuation level, steady state potential, etc., is discussed. Author

N82-16891# JAYCOR, San Diego, Calif.
ANOMALOUS TRANSPORT AND THE AMBIPOLAR FIELD IN EBT
N. A. Krall and H. H. Klein *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 293-310 refs (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

Elmo bumpy torus equilibria in present experiments have negative ambipolar potential (electron rich). Results of earlier studies in negative potential = equilibria are being used in the consideration of two specific mechanisms for anomalous transport: the diffusion due to trapped ion instability, and ion tail formation. Ion tails may form: (1) in response to instability (lower hybrid or ion sound); (2) in response to the thermal level of ion waves in a plasma; and (3) directly by ion heating in ICRH experiments. Calculations using neoclassical transport and those using neoclassical transport and ion tail formation are discussed.
A.R.H.

N82-16892# Michigan Univ., Ann Arbor.
THE EFFECT OF TRANSITING ELECTRONS ON THE AMBIPOLAR POTENTIAL IN A TANDEM MIRROR PLASMA
D. L. Galbraith and T. Kammash *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 317-328 refs Sponsored by DOE (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

In a standard tandem mirror device, the electrons trapped in the plugs generally have a temperature which is distinct from that of the central cell electrons. The latter, however, are not restrained by the electrostatic forces from entering the plug region. These electrons which enter the plug are accelerated by the potential across this region to the end of the device where the potential drops below its value in the central cell. At that point most central cell electrons are reflected back across the plug into the central cell once more. These 'passing' electrons exchange energy with the plug electrons while transiting, and for reactor grade plasmas the energy transferred to the plug electrons by these particles can be as large as 60 percent of the energy flow from the plugs to the central cell. This can result in widening the electron temperature difference between the plug and the central cell which in turn may affect the confining potential.
A.R.H.

N82-16893# California Univ., Livermore. Lawrence Livermore Lab.
CENTRAL CELL CONFINEMENT IN MFTF-B
R. A. Jong *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 329-340 refs (For primary document see N82-16877 07-75)
(Contract W-7405-eng-48)
Avail: NTIS HC A20/MF A01

The point model code TANDEM was used to survey the range of plasma parameters which can be attained in MFTF-B. The code solves for the electron and ion densities and temperatures in the central cell, yin-yang, barrier, and A-cell regions as well as the plasma potential in each region. In these studies, the A-cell sloshing ion beams were fixed while the neutral beams in the yin-yang and central cell, the gas feed in the central cell, and the applied ECRH power in the barrier region were varied. The variations of the central cell beta, central cell ion density and temperature, and the confining potential are discussed. The calculations indicate that large changes in the central cell beta cannot be achieved by varying the central cell gas or neutral beams or the yin-yang beams. Changes in these beam and gas feeds have the greatest effect on the central cell ion temperature and generally degrade the central cell confinement. Increasing the ECRH power applied to the barrier region causes an improvement in the central cell confinement and a linear increase (with applied power) of the central cell beta. Author

N82-16894# California Univ., Irvine.
INSTABILITIES IN A SMALL AXISYMMETRIC MIRROR
Michael Wickham *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 341-359 Sponsored by DOE (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

Both the interchange instability and a microinstability which is consistent with the drift cone mode were observed in an ICRH barium plasma in which T sub i was 3.5 ev and T sub e was .25 ev. The ICRH heating process was studied with the aid of laser induced fluorescence techniques, by measuring the ion velocity distribution in detail as a function of time that the ICRH was on and as a function of the mirror ratio. There is evidence that the heating process exhibits a very coherent coupling between the RF field and the ion motion. The interchange mode was consistent with a theory which included effects due to electric field, FLR, line tying and a radial conducting wall. A finite k parallel was observed in the mirror throat. The drift cone mode observed was restricted to a radial position of strong density gradient. The initial velocity distribution was measured and used in the linear stability analysis. The mode also exhibited an axial phase shift in the mirror throat. A.R.H.

N82-16895# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS DUE TO THE LARGE AMBIPOLAR POTENTIAL IN TMX
E. B. Hooper, Jr., S. L. Allen, P. Coakley (Iowa Univ., Iowa City), D. L. Correll, R. P. Drake, J. H. Foote, D. P. Grubb, G. A. Hallock (Rensselaer Polytechnic Inst.), G. D. Porter, and T. D. Rognlien *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 365-380 refs Prepared in cooperation with Johns Hopkins Univ. (For primary document see N82-16877 07-75)
(Contract W-7405-eng-48)
Avail: NTIS HC A20/MF A01

The large potentials and potential gradients in tandem mirrors have several effects. Some of these are discussed, together with supporting data from TMX. These include: axiumthal averaging by the E x B rotation, reduction of radial outward drifts (from high order multipoles) by the rapid E x B azimuthal velocity, neoclassical resonant diffusion, Joule heating of central cell ions due to nonambipolar transport in the radial electric field, low frequency instabilities, and differences between the details of the electron behavior and theory. Author

N82-16896# California Univ., Livermore. Lawrence Livermore Lab.
FORMATION AND CONTROL OF PLASMA POTENTIALS IN TMX UPGRADE
T. C. Simonen, T. J. Orzecnowski, M. Porkolab (MIT), and S. W. Stallard *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 381-406 (For primary document see N82-16877 07-75)
(Contract W-7405-eng-48)
Avail: NTIS HC A20/MF A01

The methods to be employed to form and control plasma potentials in the TMX upgrade tandem mirror with thermal barriers are described. Some ECRI generated mirror confined electron plasmas were used to establish a negative potential region to isolate the end plug and central cell electrons. This thermal isolation allows a higher end plug electron temperature and an increased central cell confining potential. Improved axial control cell ion confinement results because higher temperature central-cell ions can be confined. Calculations of the sensitivity of barrier formation to vacuum conditions and to the presence of impurities in the neutral beams, calculations of microwave penetration and absorption used to design the ECRI system, and techniques to limit electron runaway to high energies by localized microwave beams and by relativistic detuning are described. Author

N82-16897# TRW, Inc., Redondo Beach, Calif.
AMBIPOLAR POTENTIAL CONTROL BY FAST WAVE HEATING IN BUMPY TORI
R. B. Campbell, R. J. Kashuba (McDonnell Douglas Corp., St. Louis), and T. Kammash (Michigan Univ., Ann Arbor) *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 407-422 refs Sponsored in part by TRW and McDonnell Douglas (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

The ambipolarity condition in a bumpy torus heated by fast waves is modified because of the neoclassical ion flux produced by wave particle scatterings. The condition is applied to a case in which the bulk ion species is heated by the fast wave at omega = 2 omega (sub ci). It is found that the radial profile of ambipolar potential may be modified by introducing the effects of the wave energy deposition profile. Results are presented to support this claim. Author

N82-16898# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EFFECT ON AMBIPOLAR POTENTIAL OF ION CYCLOTRON HEATING
T. Snoji and F. Tsuboi *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 423-439 refs (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

Variation of ambipolar potential accompanied with ion cyclotron heating was studied. The ion cyclotron heating was carried out in Nagoya bumpy torus by using a half turn antenna which is installed near the mirror throat. The frequency of the RF oscillator is chosen to excite a slow wave mode to heat ions. In typical T mode operation, an increase in ambipolar potential and forming a positive potential hill is observed by using heavy ion beam probe and Langmuir probe. Change in potential is found to be affected by error field and has its maximum value when the field correction current is adjusted so as to minimize the toroidal current. Author

N82-16899# Oak Ridge National Lab., Tenn.
INITIAL ICRH EXPERIMENTS ON EBT-S
F. W. Baity, O. C. Eldridge, T. L. Owens, J. H. Mullen, and A. L. Henderson *In* ORNL Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors Sep. 1981 p 441-446 Prepared in cooperation with McDonnell Douglas Astronautics Co., St. Louis (For primary document see N82-16877 07-75)
Avail: NTIS HC A20/MF A01

Steady state, fast wave ion cyclotron resonant heating experiments were performed at power levels up to 10 kW on EBT-S using an all metal, double Faraday shielded 120 deg loop antenna located in a cavity midplane. A broadband matching circuit was used covering the frequency range of 10 MHz to 50 MHz. The experiments show (1) fairly high antenna loading for majority deuterium, minority hydrogen plasmas; (2) somewhat weaker coupling for pure hydrogen plasmas; (3) strongly damped but apparently propagating waves around the torus; and (4) production of substantial energetic ion tails (from charge exchange measurements). The effect of the ICRH power on other plasma parameters appear to be slight. No major problems are foreseen to the application of increased power levels in future experiments. A.R.H.

N82-16900# Argonne National Lab., Ill.
MHD HEAT AND SEED RECOVERY TECHNOLOGY PROJECT
Quarterly Report, Oct. - Dec. 1980
Michael Petrick and Terry R. Johnson Jul. 1981 45 p refs
(Contract W-31-109-eng-38)
(DE82-001608; ANL/MHD-81-1; QR-12) Avail: NTIS HC A03/MF A01

Experimental investigations are being conducted or planned in the following of critical problem areas: (1) corrosion and erosion of refractories and metal alloys; (2) NO/sub x/ behavior in the radiant boiler and secondary combustor; (3) radiant boiler design to meet the multiple requirements of steam generation, NO/sub x/ decomposition, and seed-slag separation; (4) effects of solid or liquid seed deposits on heat transfer and gas flow in the steam and air heaters; (5) formation, growth, and deposition of seed-slag particles, and (6) character of the combustion gas effluents. DOE

N82-16901# Argonne National Lab., Ill. Engineering Div.
TECHNICAL SUPPORT FOR OPEN-CYCLE MHD PROGRAM
Progress Report, Jan. - Mar. 1980
G. F. Berry, ed. Jul. 1981 110 p refs
(Contract W-31-109-eng-38)
(DE82-001955; ANL/MHD-80-6) Avail: NTIS HC A06/MF A01

The development of analytical tools needed for investigating the performance of the major components in the combined cycle MHD/steam power system is described. The analytical effort is centered on the primary components of the system that are

unique to MHD and, also, on the integration of these analytical models into a model for the entire power producing system. The present project activities include modeling of the secondary combustor, generator, radiant boiler, and formation and decomposition of NO. The results of preliminary off design studies and of system optimization studies are presented, and analysis of the U-25B generator performance, which was done in support of the proposed test plan, is included. Refinements and improvements in the MHD systems code and executive program are considered. DOE

N82-16902# California Univ., Livermore. Lawrence Livermore Lab.
PROGRESS IN THE TANDEM MIRROR PROGRAM
T. K. Fowler and R. R. Borchers 13 Sep. 1981 25 p refs Presented at the 10th European Conf. on Controlled Fusion and Plasma Phys., Moscow, 13-19 Sep. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030303; UCRL-86588; CONF-810906-9) Avail: NTIS HC A02/MF A01

Experimental results in TMX have confirmed the basic principles of the tandem mirror concept. A center cell particle confinement parameter eta tau approximately one hundred billion cu cm obtained at ion temperatures around 100 eV, which is a hundred fold improvement over single mirrors at the same temperatures. For TMX these results were obtained at peak beta values in the center cell in the range 10 to 40%, not yet limited by MHD activity, and ion cyclotron resonant heating in the Phaedrus tandem mirror experiment has produced beta values approximately 25%, which is several times the ideal MHD limit for that device. In addition, it was demonstrated that the end fan chambers of TMX simultaneously isolate the hot electrons from the end walls, provide adequate pumping and conveniently dispose of the exhaust plasma energy either by thermal deposition on the end wall or by direct conversion to electricity (at 48% efficiency in agreement with calculations). DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N82-16903# Pacific-Sierra Research Corp., Santa Monica, Calif.
THEORY OF ELECTRON-AVALANCHE BREAKDOWN IN SOLIDS Final Report
M. Sparks, D. L. Mills, R. Warren, T. Holstein, and A. A. Maradudin Mar. 1981 71 p refs
(Contract F49620-79-C-0061)
(AD-A106751; PSR-1110) Avail: NTIS HC A04/MF A01 CSCL 09/3

Electron-avalanche breakdown in solids is explained by a theory that is predictive and agrees with experimental results for the magnitude of the breakdown field and its temperature dependence, pulse-duration dependence, material-to-material variation, and wavelength dependence for delta > or = 1 micron. The good agreement between experiment and theory with no parameters adjusted is obtained by using improved magnitudes and energy dependences of the electron-phonon relaxation frequencies. The contributions of both optical and acoustical phonons to electron loss and energy-space diffusion must be included. The breakdown field E(B) is calculated by solving an eigenvalue equation obtained from the diffusion transport equation. Simple models and interpretations of the diffusion equation afford physical insight into breakdown and render the breakdown conditions predictable. Preliminary results indicate that the diffusion approximation fails for wavelengths considerably shorter than 1 micron, where multiphoton absorption must also be considered. Author (GRA)

N82-16904# Advanced Research and Applications Corp., Sunnyvale, Calif.
METAL-SEMICONDUCTOR REACTION PHENOMENA AND MICROSTRUCTURAL INVESTIGATIONS OF LASER-INDUCED REGROWTH OF SILICON ON INSULATORS Annual Progress Report, Jan. - Dec. 1980
T. J. Magee, C. Leung, R. Ormond, and R. A. Armistead Jan. 1981 25 p
(Contract DAAG29-79-C-0014)
(AD-A106357; ARACOR-TR-81-37-1; ARO-15999.5-MS) Avail: NTIS HC A02/MF A01 CSCL 20/2

The defect structure in CVD Si layers on sapphire were investigated before and after scanning laser annealing. Prior to laser annealing, the films were characterized by the presence of stacking faults, twinning zones dislocation lines producing large regions of high disorder. Subsequent to laser annealing under conditions to produce total melting of the Si layers it was shown that liquid phase epitaxial regrowth occurred resulting in regions of defect-free Si and a total absence of twinning regions. Correlated Rutherford backscattering, channeling and transmission electron microscopic analyses showed a dramatic improvement in crystalline perfection relative to the results obtained from films grown by any other technique on sapphire substrates. In separate collaborative experiments with Stanford University, it was also shown that scanning CW laser irradiation could be used to produce diffusion and activation of Sn from a spin-on SnO2/SiO2 source. The formation of a Sn3As2 alloy has been shown to be related to the observed n+ activity. Author (GRA)

N82-16905# Oregon State Univ., Corvallis. Dept. of Electrical and Computer Engineering.
HETEROJUNCTIONS IN SEMICONDUCTORS Final Report, 15 Sep. 1977 - 31 Dec. 1979
S. J. T. Owen 1 Aug. 1981 105 p refs
(Contract N00014-77-C-0608; Grants NSF SER-78-14683; NSF ENG-78-11650)
(AD-A106546) Avail: NTIS HC A06/MF A01 CSCL 20/12

Liquid phase epitaxial growth of Ge onto single crystal GaAs substrates has resulted in the growth of p+Ga-n GaAs semiconductor heterojunctions. The structures have been examined by Auger spectroscopy and their current voltage characteristics are dominated by intra-band tunneling in the low voltage region. A qualitative model for the tunneling process is introduced. Heterojunctions of n ZnO with both p and n Si have been prepared by reactive R.F. sputtering. Both n-n and p-n diodes rectify and the low forward bias characteristics show large ideality factors. The results are interpreted by a model in which macroscopic mobility, controlled by intergranular barriers, is coupled with an interface state dominated band profile. Information is given concerning technical papers and conference presentations which have been partly supported by this contract. Reprints are included of two papers which deal with the evaluation of In(1-x)Ga(x)As(y)P(1-y)/InP heterostructures. Several electron and hole traps have been identified and the growth, transport properties, defects and heterostructure device performance has been evaluated. Author (GRA)

N82-16906# Hughes Research Labs., Malibu, Calif.
ESTER LIQUID CRYSTAL MIXTURES FOR DYNAMIC SCATTERING AT ELEVATED TEMPERATURES
J. David Margerum and Anna M. Lackner Oct. 1981 33 p refs
(Contract N00014-79-C-524)
(AD-A106790; TR-2) Avail: NTIS HC A03/MF A01 CSCL 07/4

Studies are made on the effect of elevated temperature on the properties, thermal stability, and dynamic scattering (DS) of liquid crystal, ester mixtures. Six eutectic nematic mixtures are formulated with clearpoints in the range of 72 to 81C; structural effects are evaluated by using different combinations of components from eight classes of esters, including phenyl benzoates, phenyl thiobenzoates, phenyl cyclohexanecarboxylates, phenyl acloxybenzoates, as well as a phenyl benzoyloxybenzoate and a phenyl biphenylcarboxylate structure. The mixtures are characterized at 25 C, and their viscosity, dielectric anisotropy, conductivity anisotropy, and dc-activated DS effects are studied as a function of temperature. Thermal instabilities are studied at 100 C, with and without redox conductivity dopants. The DS stability with 20 V dc is studied at 55C for three of the more stable mixtures, both in transparent cells and in cells with reflective metal electrodes. Author (GRA)

N82-16907# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

DELIBERATE MODIFICATION OF THE BEHAVIOR OF N-TYPE CADMIUM TELLURIDE/ELECTROLYTE INTERFACES BY SURFACE ETCHING: REMOVAL OF FERMI LEVEL PINNING Interim Technical Report

Shinichi Tanaka, James A. Bruce, and Mark S. Wrighton 2 Sep. 1981 44 p refs Submitted for publication

(Contract N00014-75-C-0880; NR Proj. 051-579)

(AD-A106382; TR-29) Avail: NTIS HC A03/MF A01 CSCL 20/12

Single crystal, n-type CdTe (E sub g = 1.4 eV) has been studied with respect to barrier height, E sub B, when contacting a liquid electrolyte solution containing a fast, one-electron, outer-sphere redox reagent. We approximate E sub B as equal to the photovoltage measured by cyclic voltammetry of various redox couples at illuminated n-CdTe vs. a reversible electrode. N-CdTe surfaces pretreated with an oxidizing etch give an E sub B of approximately 0.5 V + or - 0.1 V in H2O/0.1 M NaClO4 or CH3CN/0.1 M (n-Bu4N)ClO4 that is independent of the E sub 1/2 of the added redox couple. A reducing etch pretreatment gives an E sub B in either of the electrolyte solutions that depends on E sub 1/2 of the redox couple in a manner consistent with a nearly ideal semiconductor. The reduced CdTe exhibits an E sub B of up to 0.9 V for a redox couple having E sub 1/2 near 0.0V vs. SCE, whereas couples having E sub 1/2 negative of approx. -1.0 V vs. SCE give zero photovoltage. Auger and X-ray photoelectron spectroscopy of the reduced and oxidized surfaces are qualitatively different. The reduced surface exhibits signals for Cd and Te in relative intensities that are consistent with a close to stoichiometric (1/1) surface. The oxidized surface exhibits little or no detectable Cd signal and the Te signal is consistent with a thick overlayer of elemental Te GRA

N82-16908# Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.

DEEP IMPURITY STATES IN GALLIUM ARSENIDE Final Report, 1 Jun. 1976 - 31 May 1980

Claude M. Penchina Oct. 1981 94 p refs

(Contract N00014-76-C-0890)

(AD-A106695; CMP811015) Avail: NTIS HC A05/MF A01 CSCL 07/4

We have studied opto-electronic properties of semi-insulating gallium arsenide, including oxygen doped, chromium doped, undoped, and ion-bombarded materials. We have found that the luminescence from chromium-doped samples has much find structure which had not been previously seen; this led to a better understanding of chromium complexing and of local lattice vibration and Fano anti-resonance at a substitutional Cr site. We have identified two other luminescence bands as related to oxygen and native defects respectively. Photoconductivity and photo-Hall studies have elucidated some of the optical transitions and showed evidence that much of the spectral shape is due to quenching effects. DLTS and thermally-stimulated current measurements were used to study oxygen doped and 'undoped' semi-insulating GaAs, revealing a variety of deep and medium-deep levels. A combination of theory and experiment has proved valuable to the understanding of the photoionization cross sections, Fano anti-resonance, and local mode coupling of the deep impurity states. Author (GRA)

N82-16909# Philips Labs., Briarcliff Manor, New York.

RESEARCH ON DEVELOPMENT OF LOW-RESISTANCE p-n JUNCTIONS IN ZnSe Final Report

B. Fitzpatrick Oct. 1981 19 p refs

(Contract N00173-80-C-0175)

(AD-A108008; PL-48-PN81-1014) Avail: NTIS HC A02/MF A01 CSCL 20/12

The doping problems associated with making a low-resistance p-n junction in ZnSe were investigated using modern epitaxial and implantation techniques. Substantial evidence for the role of nitrogen as a 'new' shallow acceptor with an ionization energy of 85 + or - 5 meV was found, and a number of other acceptors were characterized. The behavior of background donors was studied; silicon and aluminum were found to be especially harmful contaminants. A ZnSe layer with a p-type conductivity of 1.5 x 10,000 ohm-cm was made. This is the lowest p-type resistivity in ZnSe for the case where the p-type character was definitely established. Author (GRA)

N82-16910# University of Southern California, Los Angeles. Electronic Sciences Lab.

THE EFFECT OF SOLUTE-VACANCY PAIRS ON THE PHYSICAL PROPERTIES OF Si DOPED GaAs AND OTHER COMPOUND SEMICONDUCTOR SYSTEMS Final Report, 1 Jun. 1976 - 31 May 1981

W. G. Spitzer, J. M. Whelan, and S. M. Copley May 1981 116 p refs

(Grant AF-AFOSR-2990-76; AF Proj. 2306)

(AD-A107598; AFOSR-81-0746TR) Avail: NTIS HC A06/MF A01 CSCL 20/12

This is a report of a detailed and quantitative study of the influence of changes in specific defect concentrations on the microstructure and the electrical, optical and mechanical properties of Si-doped GaAs. Evidence for the GaAs: Si system demonstrates that quantitative correlations between Si-related defect concentrations and a diverse set of physical properties are observed. The measured changes in properties are large and have been employed to construct appropriate defect models. GaAs is a material of interest to the electronics community as it is used in a number of devices. The role of defects in affecting transport properties is of fundamental importance. The goal of this research is to obtain a more complete understanding of the defect structure of Si-doped GaAs through a quantitative correlation of various physical properties and concentrations of Si-related defects and also to track the effect of defect species such as solute vacancy pairs on several different physical properties. This final report summarizes the work of a 5 year study. Author (GRA)

N82-16911# Washington Univ., Seattle. Dept. of Electrical Engineering.

PHOTOACOUSTIC SPECTROSCOPY OF DIELECTRIC AND SEMICONDUCTING SOLIDS Final Scientific Report, 1 Oct. 1976 - 30 Sep. 1981

Sinclair S. Yee Sep. 1981 90 p refs

(Grant AF-AFOSR-3120-77; AF Proj. 2301)

(AD-A107613; AFOSR-81-0747TR) Avail: NTIS HC A05/MF A01 CSCL 20/12

The recently developed techniques of solid state photoacoustic spectroscopy have been applied to the study of absorption processes in dielectric and semiconducting solids which are of interest in high power laser or electronic applications. The photoacoustic effect involves the irradiation, using a modulated light source, of a material in a closed cell. Incident photons which convert to heat in the sample by nonradiative processes result in temperature and pressure fluctuations in the coupling gas in the cell synchronous with the modulated source. Through the use of appropriate pulsed and chopped cw infrared and visible wavelength sources, these investigations have provided new information about a wide range of absorption effects including optical absorption in highly transparent materials, nonlinear absorption, localized defect characterization, spectroscopy of absorbed surface impurities, and semiconductor absorption processes. The photoacoustic method has high sensitivity, good spatial and temporal resolution, and the ability to separately detect nonradiative processes, which have made it uniquely suited for these investigations. Author (GRA)

N82-16912# Varian Associates, Palo Alto, Calif. Solid State Lab.

RESEARCH ON LONG WAVELENGTH BIAS-ASSISTED PHOTOEMITTERS Final Report, Sep. 1978 - Sep. 1981

P. E. Gregory 1 Oct. 1981 40 p refs

(Contract DAAG29-78-C-0035)

(AD-A107815; ARO-15848.6-EL) Avail: NTIS HC A03/MF A01 CSCL 20/12

The infrared threshold for photoemission has been extended to 2.1 microns by use of a bias-assisted lattice-mismatched In.77Ga.23As/InAsP/InP photocathode. Quantum yield at 1.9 microns was .002 electrons/incident photon, for 2.4V bias and a temperature of approximately 125K. This photocathode structure was grown by vapor phase epitaxy. Molecular beam epitaxy (MBE) has also been used to grow In.77Ga.23As/buffer/InP structures. The effect of different buffer layer schemes, including a superlattice structure, on MBE-grown In.77Ga.23As

mobility and photoluminescence was investigated. Infrared imaging was demonstrated out to 1.65 microns using an In.53Ga.47As/InP bias-assisted photocathode operating in the transmission mode. Good reduction and sensitivity were obtained, indicating the potential usefulness of bias-assisted photocathodes for infrared imaging. Author (GRA)

N82-16913# Crystal Specialties, Inc., Monrovia, Calif.
HIGH-PRESSURE GRADIENT-FREEZE GROWTH OF SINGLE CRYSTALS OF INDIUM PHOSPHIDE Final Technical Report, 1 Apr. 1979 - 31 Dec. 1980
Worth P. Allred Griffiss AFB, N.Y. RADC Oct. 1981 24 p refs
(Contract F19628-79-C-0096; AF Proj. 4600)
(AD-A107731; RADC-TR-81-277) Avail: NTIS HC A02/MF A01 CSCL 20/2

A gradient-freeze growth system for the growth of large single crystals of InP is described. The system synthesizes and grows InP without reloading. Large poly ingots weighing up to 2,000 gms can be compounded by this method in a few hours. Ingots grown in the system have an impurity level of about 2 x 10 to the 16th power atoms/cu cm. This technique promises to be a method by which large single crystals can be grown at a reasonable cost. Author (GRA)

N82-16914# Institut Max von Laue/Paul Langevin, Grenoble (France).
LATTICE DYNAMICS OF GRAPHITE INTERCALATION COMPOUNDS: MODELLED BY THE PHONON DISPERSION OF LINEAR CHAINS
A. Magerl and H. Zebel (Illinois Univ., Urbana) 1981 4 p refs Presented at the Intern. Conf. on Phonon Phys., Bloomington, Ind., 30 Aug. 1981
(Contract DE-AC02-76ER-01198)
(PB82-000061; DOE/ER-01198/1366; CONF-810872-4) Avail: NTIS HC A02/MF A01

The characteristic features of the phonon dispersion of a monatomic linear chain in a Born-von Karman and a shell model formalism are outlined. Comparing model calculations with measurement of the /001/ phonon dispersion of intercalated graphite, that a shell model has to be used for an appropriate description. DOE

N82-16915# Purdue Univ., Lafayette, Ind.
REACTIONS OF METAL IONS AND THEIR CLUSTERS IN THE GAS PHASE USING LASER IONIZATION: ION CYCLOTRON RESONANCE SPECTROSCOPY Progress Report, 1 Jul. 1980 - 30 Jun. 1981
Ben S. Freiser Apr. 1981 31 p refs Presented at 29th Ann. Conf. on Mass Spectry., Minneapolis,
(Contract DE-AC02-80ER-10689)
(DE81-029015; DOE/ER-10689/1; CONF-810548-8) Avail: NTIS HC A03/MF A01

Advances in proposed studies on metal ion chemistry and expansion of laboratory facilities are discussed. The development of a combined pulsed laser source-ion cyclotron resonance spectrometer proved to be a convenient and powerful method for generating metal ions and for studying their subsequent chemistry in the gas phase. The application of metal ions as a selective chemical ionization reagents and progress in this area are discussed. Mechanisms useful in interpreting the chemical ionization spectra of unknown compounds and tests for the functional group selectivity of the various metal ions are emphasized. Preliminary results on sulfur containing compounds and a metallic ions were obtained. Laboratory facilities were expanded from one ion cyclotron resonance spectrometer to two, plus a third instrument the Fourier Transform Ion Cyclotron Resonance spectrometer. DOE

N82-16916# Illinois Univ., Urbana. Lab. of Physics.
PHONONS IN ALKALI GRAPHITE INTERCALATION COMPOUNDS
H. Zabel and A. Magerl (Inst. Max von Laue/Paul Langevin) 1981 4 p refs Presented at the Intern. Conf. on Phonon Phys., Bloomington, Ind., 30 Aug. 1981
(Contract DE-AC02-76ER-01198)
(DE82-000059; DOE/ER-01198/1365; CONF-810872-2) Avail: NTIS HC A02/MF A01

The (001)L phonon branches of alkali-graphite intercalation compounds C/sub x/M (x = 8, 24, 36; M = K, Rb, Cs) have been measured by means of inelastic neutron scattering experiments. In all cases the phonon branches show zone folding effects, due to the enlarged unit cell as compared to pristine graphite, along with opening of frequency gaps at the center and boundary of the Brillouin zone. All measured (001)L phonon dispersions are describable by one dimensional shell models with different masses and force constants to account for the graphite and alkali area-mass densities along the c-axis and their interplanar interactions. DOE

N82-16917# California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF SHOCK-INDUCED SIGNALS AND COHERENT EFFECTS IN SOLIDS BY MOLECULAR DYNAMICS
Arnold M. Karo, Franklin E. Walker, Warren G. Cunningham, and John R. Hardy (Nebraska Univ., Lincoln) 31 Aug. 1981 22 p Presented at the 8th Intern. Colloq. on Gasdyn. of Explosions and Reactive Systems, Minsk, 23-26 Aug. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030412; UCRL-85576; CONF-810874-1) Avail: NTIS HC A02/MF A01

Molecular dynamics calculations are presented that address the extent of microscopic detail that can be deduced from macroscopic gauge measurements of shock propagation in condensed systems. Large asymmetrically shock-loaded lattices were simulated varying the initial temperature of both the loading plates and the lattice. Specifically: triple shock loading of a thin lattice; double shock loading of the same lattice; and triple shock loading of a thick lattice were studied. In all cases strong memory effects in that the spall pattern always mirrors the loading history were found. This is a direct consequence of two basic results: (a) the energy in finite width shocks is only weakly coupled to motions transverse to their direction of propagation; and (b) coupling between shock motion and random thermal motion is relatively weak, even in lattices that are near their melting temperatures. DOE

N82-16918# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF THERMOMECHANICAL PROPERTIES ON INITIAL CAVITY GROWTH
R. E. Glass 1981 21 p refs Presented at the 7th Underground Coal Conversion Symp., Fallen Leaf Lake, Calif., 8 Sep. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030839; SAND-81-1941C; CONF-810923-9) Avail: NTIS HC A02/MF A01

Recent field and laboratory studies in UCG have indicated that the thermomechanical properties of coals may be the controlling parameters in determining initial cavity growth. To examine this possibility laboratory and modeling efforts are being directed at determining these properties and incorporating them in a cavity growth model. The results of the work emphasize the critical role that anisotropic strengths play in determining the shape of the cavity. DOE

N82-17073*# Alabama Univ. in Huntsville. Dept. of Mathematics.
SURFACE CONTROL TEMPERATURES FOR THE BRIDGMAN-STOCKBARGER AND FLOAT ZONE TECHNIQUES
Larry M. Foster *In its* the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 14 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20L

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-16919# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

RANDOM ANISOTROPY EFFECTS IN ISING SPIN GLASS M.S. Thesis [EFEITOS DE ANISOTROPIA ALEATORIA EM UM SPIN GLASS DE ISING]
Maria Cristina Forti Aug. 1981 50 p refs In PORTUGUESE; ENGLISH abstract
(INPE-2194-TDL/061) Avail: NTIS HC A03/MF A01

The thermodynamic properties of an Ising model for a spin glass are studied by mean field theory. Crystal field effects are considered and the crystal field parameter fluctuates about a mean value. The exchange is random with finite range but has a mean value equal to zero. This model exhibits paramagnetic and spin glass phases. The free energy is calculated by means of replica procedure. Then, the order parameter, the parallel and perpendicular susceptibilities and the specific heat are obtained as functions of temperature; these curves show a phase transition at the critical temperature. Author

N82-16920# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
NATURE ABHORS AN EMPTY VACUUM
Marvin Minsky Aug. 1981 15 p refs
(Contract N00014-79-C-0260)
(AD-A106362; AI-M-647) Avail: NTIS HC A02/MF A01 CSCL 20/10

Imagine a crystalline world of tiny, discrete 'cells', each knowing only what its nearest neighbors do. Each volume of space contains only a finite amount of information, because space and time come in discrete units. In such a universe, we'll construct analogs of particles and fields, and ask what it would mean for these to satisfy constraints like conservation of momentum. In each case classical mechanics will break down, on scales both small and large, and strange phenomena emerge: a maximal velocity, a slowing of internal clocks, a bound on simultaneous measurement, and quantum-like effects in very weak, or intense fields. GRA

N82-17061*# Clemson Univ., S.C. Dept. of Physics and Astronomy.
MATTER IN GENERAL RELATIVITY
John R. Ray *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 13 p refs (For primary document see N82 17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20J

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N82-17068*# Alabama Univ. in Huntsville. Dept. of Education.
ASSESSMENT OF MSFC'S SUPERVISORY TRAINING PROGRAMS AND COURSES
Thomas A. Brindley *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 13 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 05I

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-16921*# National Aeronautics and Space Administration, Washington, D. C.
PRINCIPLES OF PROJECT MANAGEMENT
Jan. 1982 8 p
(NASA-TM-84089; NHB-7120.2) Avail: NTIS HC A02/MF A01 CSCL 05A

The basic principles of project management as practiced by NASA management personnel are presented. These principles are given as ground rules and guidelines to be used in the performance of research, development, construction or operational assignments. J.M.S.

N82-16922# Illinois Univ., Urbana. Dept. of Architecture.
FORMAL TECHNIQUES FOR ANALYSIS AND DESIGN OF PURPOSIVE ORGANIZATIONS Final Report
E. L. Murphree, Jr., R. M. Dinnat, Patricia Clickener, and Richard Matthews Sep. 1981 93 p refs
(Grant AF-AFOSR-0090-80; AF Proj. 2313)
(AD-A106775; AFOSR-81-0711TR) Avail: NTIS HC A05/MF A01 CSCL 05/1

A framework for a generic model of purposive human organizations is presented. The static model is based on relationships between pairs of resources, pairs of tasks, and resource-task pairs. The heart of the approach is a relational matroid which allows notations of such basic organizational patterns as authority, groupings of resources, task precedence, assignment of resources to tasks, and information flow. Author (GRA)

N82-16923# National Bureau of Standards, Washington, D.C. Experimental Technology Incentives Program.
A MANUAL FOR DESIGNING AND IMPLEMENTING A PROCESS TO MONITOR COMPLEX SYSTEM DEVELOPMENTS Final Report
Stephen D. Garrity Sep. 1981 66 p ref
(PB82-104308; NBSIR-81-2328) Avail: NTIS HC A04/MF A01 CSCL 05A

A manual for designing and implementing a process to monitor key areas of a complex system development is presented. The manual is derived from an internal study of system developments in the National Bureau of Standards. The proposed monitoring proccess consists of a framework of thirty factors and a set of five functions which monitoring can serve. Author (GRA)

N82-16924# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN INTERACTIVE APPROACH TO MULTIPLE CRITERIA DECISION MAKING BASED ON STATISTICAL INFERENCE
Theodor J. Stewart Mar. 1981 31 p refs
(PB82-108747; TWISK-204) Avail: NTIS HC A03/MF A01 CSCL 05A

An interactive algorithm is proposed for the problem of selecting one of a finite number of alternatives, where each is evaluated in terms of a number of conflicting criteria. A simple form of utility function is assumed, and the possibility is modelled probabilistically that the decision maker may at any time indicate a preference between alternatives in conflict with his true utility. Author (GRA)

N82-16925# American Univ., Washington, D. C.
APPROPRIATION REIMBURSEMENTS Final Report
Robert E. Dorosz 1981 88 p refs Sponsored in part by Dept. of Defense
(PB81-245409; Rept-102-79-7) Avail: NTIS HC A05/MF A01 CSCL 05A

Appropriation reimbursements have been part of the Department of Defense's accounting, budgeting and reporting systems since the enactment of Sect. 601 of the 1932 Legislative Appropriations Act. An historical background on appropriation reimbursements is presented, current issues and problems, are discussed, and recommendations to improve the reimbursement process are introduced. GRA

N82-16128*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPTIMUM EQUIPMENT MAINTENANCE/REPLACEMENT POLICY. PART 1: DYNAMIC PROGRAMMING APPROACH
T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 236-245 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05A

N82-17075*# Baylor Univ., Waco, Tex. Dept. of Mathematics
MATHEMATICAL PROGRAMMING TECHNIQUES FOR

SCHEDULING SPACELAB CREW ACTIVITIES AND EXPERIMENT OPERATIONS
William C. Askew *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 05A

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N82-16926# RAND Corp., Santa Monica, Calif.
ELECTRONIC INFORMATION SYSTEMS AND USER CONTEXTS: EMERGING SOCIAL SCIENCE ISSUES
Tora K. Bikson Sep. 1981 13 p refs
(RAND/P-6690) Avail: NTIS HC A02/MF A01

The search for more rapid error-free communication as well as the growing need to link information processing systems to large or remote databases and other equipment is creating a burgeoning demand for local networks. A new eight-year forecast from International Resource Development, Inc. predicts local networks will represent a $3.2 billion market by 1990, even though only rudimentary short-range networks are presently available. The introduction of electronic information systems in myriad user settings, comprises a trend of long-term national significance. Clearly alternative choices in the management of that process can have substantially different economic and social impacts. With the technological barriers to such change being rapidly eliminated, a number of issues emerge for social research. The policy issues concern the kinds of choices that should be made during the implementation of electronic information systems in varied user settings. L.F.M.

N82-16927*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Management Services Office.
FISCAL YEAR 1981 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS
Sarah S. Thacker, comp. Oct. 1981 70 p
(NASA-TM-82445) Avail: NTIS HC A04/MF A01 CSCL 05B

This bibliography lists approximately 503 formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY-1981. It also includes papers of MSFC contractors. Citations announced in the NASA scientific and technical information system are noted. N.W.

N82-16928# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Computer Science, Industrial Engineering and Operations Research.
USER CONSIDERATIONS IN COMPUTER-BASED INFORMATION SYSTEM
Beverly H. Williges and Robert C. Willings Sep. 1981 92 p refs
(Contract N00014-81-K-0143)
(AD-A106194; CSIE-81-2) Avail: NTIS HC A05/MF A01 CSCL 05/8

The purpose of this report is to compile in one document the variety of user considerations relating to software design of computer-based information systems. Approximately 500 such considerations that currently exist in a variety of thirteen source documents are included. For organizational purposes, the compilation was divided into seven major parts including data organization, dialogue modes, user input devices, command language and command processing, feedback and error management, security and disaster prevention, and multiple user communication. Author (GRA)

N82-16929# Mid-American Solar Energy Complex, Minneapolis, Minn.
REGIONAL NEEDS REGARDING TECHNICAL INFORMATION
Jul. 1981 16 p refs
(Contract DE-AC02-79CS-30150)
(DE82-001772; MASEC-R-81-057; A-104-4) Avail: NTIS HC A02/MF A01

Regional needs for technical information regarding solar systems and components are evaluated. The information requested from the MASEC Information Center can be separated into design, performance, and economic categories. The types of questions most frequently asked in each of these categories are listed. Comments by MASEC on the draft of the National Solar Data Network (NSDN) program are presented in the appendix. DOE

N82-16930# National Library of Medicine, Bethesda, Md.
PERMUTED MEDICAL SUBJECT HEADINGS, 1982
Jul. 1981 369 p
(PB81-227464; NLM-MED-81-04) Copyright. Avail: Issuing Activity CSCL 05B

A computer-generated display, of descriptors and cross references in the alphabetic list, Medical Subject Headings (MeSH) for 1982, and of all citation type, check tag, and geographic descriptors in the Annotated Alphabetic MeSH, 1982 is given. The Permuted MeSH lists all the MeSH terms in which each significant word appears. GRA

N82-16931# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS: TREE STRUCTURES, 1982
Jul. 1981 454 p
(PB81-227472; NLM-MED-81-03) Copyright. Avail: Issuing Activity CSCL 05B

Medical subject headings currently used by indexers, catalogers, and searchers are arranged in a hierarchical manner showing relationships between broader and narrower terms. Included are minor and geographic descriptors. GRA

N82-16932# National Library of Medicine, Bethesda, Md. Medical Subject Headings Sect.
MEDICAL SUBJECT HEADINGS: ANNOTATED ALPHABETIC LIST, 1982
Jul. 1981 822 p
(PB81-227480; NLM-MED-81-02) Avail: NTIS HC A99/MF A01 CSCL 05B

An expanded version of Medical Subject Headings (MeSH) adapted to the needs of indexers, catalogers, and persons searching the National Library of Medicine computer database is given. The list includes cross references, geographic headings, non-MeSH terms, check tags, tree numbers, and notes for indexers, catalogers and online searchers. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-16933# Bureau of the Census, Washington, D. C.
THE 1977 CENSUS OF MINERAL INDUSTRIES. WEST NORTH CENTRAL DIVISION
Mar. 1981 51 p ref
(PB81-243081; MIC77-A-4) Avail: NTIS MF A01; SOD HC CSCL 05C

From a universe of approximately 29,000 mining establishments in the 1977 Census of Mineral Industries, approximately 11,000 small single-establishment companies were excused from filing reports. Selection of the single-establishment nonmail cases was done on an industry-by-industry basis. A variable cutoff was used to determine those establishments for which administrative records were to be used in place of a census report. The cutoffs were selected so that the administrative records cases would account for approximately 3 percent of the value of shipments for the industry. These cutoffs were then adjusted so that all single-establishment companies with fewer than 5 employees were excluded from the mail canvass, while all establishments with more than 20 employees were included. An abbreviated census form was used for the crushed stone

and construction sand and gravel industries, in which most establishments in the 5 to 20 employee size range were included. N.W.

N82-16934# Bureau of the Census, Washington, D. C.
THE 1977 CENSUS OF MINERAL INDUSTRIES. SOUTH ATLANTIC DIVISION
Mar. 1981 52 p ref
(PB81-243099; MIC77-A-5) Avail: NTIS MF A01; SOD HC CSCL 05C

Coverage includes all southern Atlantic establishments primarily engaged in mining as defined by the Standard Industrial Classification Manual. Mining operations are classified by industry on the basis of the prinicipal mineral produced or on the basis of the principal mineral for which exploration or development work is in progress. Each mining establishment of firms with one paid employee or more operating in the United States is covered. Every concern operating oil and gas wells, drilling wells, or exploring for oil and gas was required to submit a separate report for each state or offshore area adjacent to each state in which it conducted such activities. GRA

N82-16123*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LIFE-CYCLE COST ANALYSIS OF PROJECTS USING A POLYNOMIAL CASH FLOW MODEL FOR NONUNIFORM MAINTENANCE AND OPERATIONS COSTS
D. S. Remer and G. Lorden (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 191-201 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05C

N82-16130*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPUTERIZED LIFE-CYCLE COST METHODOLOGY FOR ENGINEERING ANALYSIS
R. D. Hughes *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 268-287 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 05C

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-16935# Battelle Pacific Northwest Labs., Richland, Wash.
ANALYSIS OF FEDERAL INCENTIVES USED TO STIMULATE ENERGY CONSUMPTION
R. J. Cole, B. W. Cone, J. C. Emery, M. Huelshoff, D. E. Lenerz, A. Marcus, F. A. Morris, W. J. Sheppard, and P. Sommers Aug. 1981 266 p refs
(Contract DE-AC06-76RL-01830)
(DE81-031928; PNL-3558) Avail: NTIS HC A12/MF A01

Federal incentives that have increased the consumption of coal, oil, natural gas and electricity are identified. The stimulus comes through changing values of variables included in energy demand functions, thereby inducing energy consumers to move along the function in the direction of greater quantity of energy demanded, or through inducing a shift of the function to a position where more energy will be demanded at a given price. The demand variables fall into one of six categories: price of the energy form, price of complements, price of substitutes, preferences, income, and technology. The government can provide such incentives using six different policy instruments: taxation, disbursements, requirements, nontraditional services, traditional services, and market activity. The four major energy forms were examined. Six energy consuming sectors were examined: residential, commercial, industrial, agricultural, transportation, and public. DOE

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N82-16936# Committee on Science and Technology (U. S. House).
LONG-TERM PLANNING FOR NATIONAL SCIENCE POLICY
Wasington GPO 1981 320 p refs Hearings before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 182, 28-31 Jul. 1980
(GPO-68-603) Avail: NTIS Avail: Subcommittee on Science, Research and Technology

The question of how to better identify science policy goals and planning processes for both Congressional and public understanding was addressed. The need to examine short-term national actions on budget policies and their integration into long term policy planning for the future was discussed. The main objective of the study is to identify ways to modify and improve current planning done by the Federal Government. M.D.K.

N82-16937*# AiResearch Mfg. Co., Phoenix, Ariz.
ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS Progress Report, Oct. 1979 - Jun. 1980
Nov. 1980 431 p refs
(Contract DEN3-167)
(NASA-CR-165175; DOE/NASA/0167-80/1; AiResearch-31-3725; PR-1) Avail: NTIS HC A19/MF A01 CSCL 13F

Progress in the development of a gas turbine engine to improve fuel economy, reduce gaseous emissions and particulate levels, and compatible with a variety of alternate fuels is reported. The powertrain is designated AGT101 and consists of a regenerated single shaft gas turbine engine, a split differential gearbox and a Ford Automatic Overdrive production transmission. The powertrain is controlled by an electronic digital microprocessor and associated actuators, instrumentation, and sensors. Standard automotive accessories are driven by engine power provided by an accessory pad on the gearbox. Component/subsystem development progress is reported in the following areas: compressor, turbine, combustion system, regenerator, gearbox/transmission, structures, ceramic components, foil gas bearing, bearings and seals, rotor dynamics, and controls and accessories. J.M.S.

N82-16938*# Boeing Computer Services Co., Tukwila, Wash.
HYBRID AND ELECTRIC ADVANCED VEHICLE SYSTEMS (HEAVY) SIMULATION Final Report
Ronald A. Hammond and Richard K. McGehee Nov. 1981 89 p refs
(Contract DEN3-151; DE-AI01-77CS-51044)
(NASA-CR-165536; DOE/NASA/0151-1; BCS-40357) Avail: NTIS HC A05/MF A01 CSCL 13F

A computer program to simulate hybrid and electric advanced vehicle systems (HEAVY) is described. It is intended for use early in the design process: concept evaluation, alternative comparison, preliminary design, control and management strategy development, component sizing, and sensitivity studies. It allows the designer to quickly, conveniently, and economically predict the performance of a proposed drive train. The user defines the system to be simulated using a library of predefined component models that may be connected to represent a wide variety of propulsion systems. The development of three models are discussed as examples. M.G.

N82-16939# California Univ., Livermore. Lawrence Livermore Lab.
TECHNOLOGY TRANSFER OF COMPUTER-AIDED ENGINEERING TO THE UNIVERSITY COMMUNITY

W. J. Comfort, III, B. E. Brown, B. R. Bowman, and A. Harral, III Apr. 1981 17 p refs Presented at the Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, D.C., 15-20 Nov. 1981
(Contract W-7405-eng-48)
(UCRL-85694; CONF-811101-1) Avail: NTIS HC A02/MF A01

Computer aided engineering, which includes modeling, analysis, and design, with graphical representation for both input and output, is becoming an increasingly important contributor to national productivity. The demand for persons skilled in the field is growing rapidly. It is expected that the needs for such skills will far exceed the ability of the university community to supply them, unless something is done now. The Lawrence Livermore National Laboratory (LLNL) has initiated a new project, in cooperation with the university community, to increase the student's use of and familiarity with the computer in engineering schools. The ultimate objective is increasing the national productivity. DOE

N82-16940# California Univ., Livermore. Lawrence Livermore Lab.
TECHNOLOGY TRANSFER AND DEVELOPMENT OF COMPUTER-AIDED ENGINEERING WITH THE UNIVERSITY COMMUNITY
W. J. Comfort, III, R. E. Brown, B. R. Rowman, and A. Harral, III Jun. 1981 8 p refs Presented at the Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, D.C., 15-20 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-022408; UCRL-85694-Rev-1; CONF-811101-1-Rev-1) Avail: NTIS HC A02/MF A01

Computer-aided engineering (CAE), the process of using the computer interactivity for modeling, analysis, and design with graphical representation for both input and output, is becoming an increasingly important contributor to engineering productivity. The demand for persons skilled in this field is growing rapidly. The need for such skills will exceed the ability of the university community to supply them, unless something is done now. The Lawrence Livermore National Laboratory (LLNL) has initiated a new technology transfer project in cooperation with the university community. The objectives of this program are to increase the student's use of and familiarity with the computer in engineering schools and ultimately to assist in increasing engineering productivity. DOE

N82-16941# Sandia Labs., Albuquerque, N. Mex.
SYSTEMS STUDIES OF WASTE TRANSPORTATION
G. C. Allen, J. W. Cashwell, C. G. Shirley, and M. G. Vigil 1981 11 p refs Presented at the NWTS Program Inform. Meeting, Columbus, Ohio, 17-19 Nov. 1981 Sponsored by DOE
(DE81-030840; SAND-81-1966C; CONF-811119-2; TTC-0244) Avail: NTIS HC A02/MF A01

The National Waste Terminal Storage transportation technology task is a combination of activities directed at both Test and Evaluation Facility (TEF) and future Full Scale Repositories (FSR), however, prime emphasis is being placed on TEF tasks. In response to the redirection of the NWTS program, TTC activities in FY 1982 will focus on transportation of commercial high level and transuranic waste, although spent fuel will still be considered. Consistent with the TEF and FSR design development schedules, the transportation system and receiving facility interface technology task will receive increased emphasis in FY 1983, while the logistics and NEPA compliance tasks will continue to be major program areas. DOE

N82-16942# San Bernardino Valley Municipal Water District, Calif.
FEASIBILITY OF GEOTHERMAL HEAT USE IN THE SAN BERNARDINO MUNICIPAL WASTEWATER TREATMENT PLANT Final Report, Sep. 1980 - Jun. 1981
W. C. Racine, T. C. Larson, C. A. Stewart, and H. B. Wessel 1981 115 p refs Prepared in cooperation with Science Applications, Inc., La Jolla, Calif., and Stewart (Coulter) and Associates, Inc., Davis, Calif.
(Contract DE-FG03-80SF-11442)
(DE81-030968; DOE/SF-11442/T2) Avail: NTIS HC A06/MF A01

A system was developed for utilizing nearby low temperature geothermal energy to heat two high rate primary anaerobic digesters. The geothermal fluid would replace the methane currently burned to fuel the digesters. The design and operation of the facility are examined and potentially viable applications selected for additional study. Results of these investigations and system descriptions and equipment specifications for utilizing geothermal energy in the selected processes are presented. The economic analyses conducted on the six engineering design cases are discussed. The environmental setting of the project and an analysis of the environmental impacts that will result from construction and operation of the geothermal heating system are discussed. DOE

N82-16943# Oak Ridge National Lab., Tenn.
ELECTRIC CAR: IS IT STILL THE VEHICLE OF THE FUTURE
R. L. Graves, C. D. West, and E. C. Fox Aug. 1981 29 p refs
(Contract W-7405-eng-26)
(DE81-030437; ORNL/TM-7904) Avail: NTIS HC A03/MF A01

An analysis of electric and internal combustion engine (ICE) cars of equivalent performance shows that, even with advanced batteries, the electric vehicle would be much more costly to run (23 cents/mile vs 16 cents/mile) than the ICE car. The electric vehicle, of course, would not use gasoline, thus reducing the nation's dependence on imported oil; however, the cost of oil saved in this way would be about $190/bbl, and the same result could be achieved at about one quarter the cost by manufacturing synfuels from domestic coal or oil shale. A similar analysis of some proposed hybrid electric vehicles indicates that they are also more costly to operate than an equivalent conventional vehicle, although by a smaller margin. The cost of oil saved by the use of hybrid vehicles is also lower, although it is still much more than the projected cost of synthetic fuels. The key to improving the economics of the electric vehicle is to increase battery life or lower battery costs. DOE

N82-16944# California Univ., Berkeley. Lawrence Berkeley Lab.
FUTURE TRENDS IN ADVANCED BATTERIES FOR AUTOMOBILE PROPULSION
Elton J. Cairns Oct. 1980 6 p Presented at the Intern. Symp. on Electrochem. in Ind.--New Direc. Panel Discussion on Future Trends in Major Electrochem. Ind. Case Inst. of Technol. Centennial Celebration, Cleveland, 20-22 Oct. 1980
(Contract W-7405-eng-48)
(DE81-030543; LBL-13109; CONF-801027-1) Avail: NTIS HC A02/MF A01

The possible market for vehicle propulsion batteries is discussed, and the performance goals for a marketable electric vehicle are outlined. Some advanced batteries that have the best chance of finding application in electric automobiles are mentioned. DOE

N82-16945# California Univ., Livermore. Lawrence Livermore Lab.
COMPARISON OF ENERGY-STORAGE DEVICES FOR USE IN FUTURE AUTOMOBILES
L. G. Connell 20 Jun. 1981 11 p refs Presented at Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, D.C., 15-20 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-026530; UCRL-85654; CONF-811101-6) Avail: NTIS HC A02/MF A01

Energy storage devices and their associated propulsion systems which are likely to be capable of providing credible alternatives to current type automotive propulsion systems between now and the year 2000 were studied. It was found that a complete spectrum of automotive performance levels can be achieved by energy storage automobiles during this time period. These range from automobiles with general purpose performance equivalent to internal combustion engine performance to performance suitable for vehicles with specific missions. DOE

N82-16946# McElroy (Ralph) Co., Austin, Tex.
TRANSPORT AND ENERGY
Arturo Abriani Sep. 1981 17 p Transl. into ENGLISH from the Symp. on Evaluation and Reinforcement of Pavements and Energy in Transportation (Argentina), 1980 p 103-109 Symp. held in San Miguel de Tucuman, Argentina, 4-6 Sep. 1980; sponsored by the Argentine Congresses of Highway Administration and Traffic Prepared jointly with Argonne National Lab.
(DE81-030287; ANL-Trans-1198) Avail: NTIS HC A02/MF A01

Energy sources used and the growth of energy consumption in the transportation sector in Argentina are discussed. Energy consumption by the transportation sector in some other major countries of the world are briefly noted. Optimizing transportation energy consumption by means of energy conservation is mentioned. Comparisons are made of energy consumed by rail and road vehicles in urban and interurban areas for freight and passenger transport. DOE

N82-16947# South Coast Technology, Inc., Dearborn, Mich.
AUGMENTATION OF RESEARCH AND ANALYSIS CAPABILITIES FOR TIMELY SUPPORT OF AUTOMOTIVE FUEL ECONOMY ACTIVITIES Final Report, Oct. 1977 - Jan. 1978
Harold M. Siegel, R. Schwarz, J. Andon, T. Gerstenberger, R. Renner, K. C. Kececioglu, W. Morgan, L. Mercer, and A. Cattaneo Mar. 1981 412 p refs
(Contract DOT-HS-7-01790)
(PB81-247553; DOT-HS-805956) Avail: NTIS HC A18/MF A01 CSCL 13F

A series of studies was conducted in support of the Office of Research and Development of the NHTSA in areas of automotive design and technology that could affect fuel economy. Nine such studies were carried out and included assessments of spark ignition engine; fuel economy improvement potential; potential of changes in rolling resistance, aerodynamic drag, accessory load and lubricants. Other studies included a study of the potential of alternative engines, a compilation of literature, and a preliminary assessment of diesel particulates. In addition to conducting studies based on a literature review and analysis, there were two hardware studies conducted in the form of teardown studies of selected passenger car (Ford Fairmont) and light truck (Chevy Luv)z models. GRA

N82-16948# Market Facts, Inc., Arlington, Va. Public Sector Research Group.
CONSUMER BEHAVIOR TOWARDS FUEL EFFICIENT VEHICLES, VOLUME 2 Final Report, Oct. 1977 - Mar. 1981
James T. Heisler and Sid Groeneman Mar. 1981 127 p
(Contract DOT-HS-7-01781)
(PB81-246654; DOT-HS-805937-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 10A

Information on likely market response to various vehicle design and performance changes is studied to minimize the possibility of market rejection. The report is based on focus group discussions and consumer experiments with drivers in different vehicle size classes. Analysis focuses on the believability of the energy crisis and concern about its effects, the acceptability of possible fuel economy options, consumer preferences with respect to vehicles embodying selected design and engineering changes, and predicted purchase and usage patterns under different future scenarios. GRA

N82-16949# Naval Underwater Systems Center, Newport, R.I. Office of Special Programs Development.
ENHANCING TECHNOLOGY TRANSFER TO STATE AND LOCAL GOVERNMENT UTILIZING ON-LINE INFORMATION RETRIEVAL SERVICES AND ON-LINE COMMUNICATIONS SYSTEMS
Ronald G. Heroux May 1981 50 p
(Grant NSF ISP-79-08603)
(PB81-246241; NSF/ISP-81015) Avail: NTIS HC A03/MF A01 CSCL 05A

Work accomplished in a study by the State of Rhode Island on the use of cable television (CATV) to serve public, educational, and government needs is reported. Development of on-line information services, electronics communication, and the use of CATV in Rhode Island is discussed. Some requirements include (1) the establishment of a separate institutional cable connecting most state municipal, educational, religious, and non profit buildings at no charge to these organizations; (2) a four-channel state-wide interconnect system; and (3) provision of portable and fixed television equipment to be used by community groups, educators, and the community-at-large for the preparation of local and state-wide programs at no cost to the user. On-line data bases and evaluation of information services are provided. GRA

N82-16950# Energy and Environmental Analysis, Inc., Arlington, Va.
DEVELOPMENT OF ADJUSTMENT FACTORS FOR ON ROAD FUEL ECONOMY Final Report
Robert Crawford, Peter Forshay, and Robert Dulla Mar. 1981 219 p refs
(Contract EPA-68-03-2888)
(PB81-241986; EPA-460/3-81-003) Avail: NTIS HC A10/MF A01 CSCL 13F

The differences between EPA test-measured and actual on-road fuel economy were evaluated. It is expected that the methodology and the adjustment factors developed will form the basis for a labeling system that in future model years, will discount the EPA test measurements of new cars to estimate on road fuel economy. Because new cars employ a growing percentage of fuel efficient technologies having distinctly lower levels of shortfall than traditional ones, this analysis has carefully evaluated and to the extent that available data permit, quantified the shortfall of the alternative technologies. GRA

N82-16951# Mobility Systems Equipment Co., Los Angeles, Calif.
EVALUATION OF RETRO-REFLECTIVE MEASUREMENT DEVICES Final Report
A. G. Hoffman Jun. 1981 66 p refs
(Contract DOT-FH-11-9532)
(PB81-243594; P8102FR; FHWA/TS-81/213) Avail: NTIS HC A04/MF A01 CSCL 13F

Four instruments capable of measuring the retro-reflectance of highway traffic stripes under daylight conditions in the field were identified and evaluated. Two of these instruments are manufactured in Europe. The others were developed in the United States but are not commercially available. Three of the instruments are conveniently usable by field crews for this purpose. GRA

N82-16952# Mobility Systems Equipment Co., Los Angeles, Calif.
EVALUATION OF RETRO-REFLECTIVE MEASUREMENT DEVICES Summary Report
A. G. Hoffman Washington Federal Highway Administration Jun. 1981 17 p
(Contract DOT-FH-11-9532)
(PB81-243602; P8102SR; FHWA/TS-81/212) Avail: NTIS HC A02/MF A01 CSCL 13F

The project was conducted to identify and evaluate instruments capable of measuring the retro-reflectance of highway traffic stripes under daylight conditions in the field. Four instruments were identified and evaluated. Two of these instruments are manufactured in Europe. The others were developed in the United States but are not commercially available. All instruments evaluated have some capability for measuring retro-reflectance of highway traffic stripes in the field. Three of the instruments are conveniently usable by field crews for this purpose. A final report containing documentary photographs and detail test data is available from NTIS. GRA

N82-16953# Transportation Systems Center, Cambridge, Mass.
AN INVESTIGATION OF TRUCK SIZE AND WEIGHT LIMITS: TECHNICAL SUPPLEMENT. VOLUME 3: TRUCK AND RAIL FUEL EFFECTS OF TRUCK SIZE AND WEIGHT LIMITS Final Report, Oct. 1978 - Jun. 1981
David A. Knapton Jul. 1981 142 p refs
(PB82-100538; DOT-TSC-OST-81-2) Avail: NTIS HC A07/MF A01 CSCL 13E

Data and analytical methods to estimate probable changes in direct and indirect fuel consumption for new truck size and weight limits are presented. These effects are examined in terms of changes in the competitive relationships between highway

and rail services. The method for estimating fuel consumption includes line haul and access fuel and makes allowance for the system fuel requirements of empty backhaul and circuitry. Single unit trucks, conventional tractor-semi-trailer, Western Doubles, Turnpike Doubles, and Triple Trailer combination rigs as well as the competitive carload boxcar and TOFC rail services are considered. Truck service (i.e., van, reefer, household moving van, flat bed, tanker and dump), and the competitive rail services are disaggregated. Author

N82-16954# Informatics, Inc., Rockville, Md. Noise Information Program.

FOREIGN NOISE RESEARCH IN SURFACE TRANSPORTATION, 1978-1981

Dick Barber and Carl Modig May 1981 373 p

(PB82-100306; EPA-550/9-81-317) Avail: NTIS HC A16/MF A01 CSCL 13F

Information on foreign research projects in surface transportation noise abatement was collected from both individuals and organizations. They were asked to respond with information about research projects that deal with: highway vehicle noise control (trucks, buses, cars, etc.); vehicle component noise control (engines, exhaust mufflers, cooling systems, power trains, tires, etc.); roadway surface materials, tire/road interaction; path control (barriers, insulation, highway planning and land management); highway noise analysis (prediction models, propagation theory, etc.); rail noise (guided mass transit, light rail, elevated structures, wheel/rail interaction); off road and recreational vehicle noise, measurement, monitoring and enforcement research. From these contacts, 294 surface transportation noise research projects were identified. GRA

N82-16955# Crain and Associates, Menlo Park, Calif.

PARATRANSIT, INC., SPECIAL TRANSPORTATION SERVICE IN SACRAMENTO Final Report, Nov. 1978 - Mar. 1980

Sydwell Flynn Cambridge, Mass. DOT Jul. 1981 159 p refs

(Contract DOT-TSC-1408)

(PB82-106204; DOT-TSC-UMTA-81-47; UMTA-MA-06-0049-81-6) Avail: NTIS HC A08/MF A01 CSCL 13B

Special transportation for handicapped and elderly persons in the Sacramento area is discussed. A vehicle maintenance center for the servicing and repair of paratransit vehicles operated by social service agencies themselves, project operations and developments, costs, impacts and workability are discussed.GRA

N82-16956# National Bureau of Standards, Washington, D.C.

DIMENSIONS, VOLUME 65, NUMBER 4, MAY/JUNE 1981 Monthly Report

Jun. 1981 33 p

(PB82-106006; NBS-DIM-65-4) Avail: NTIS HC A03/MF A01 CSCL 05A

The monthly magazine features short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications. The table of contents for the current issue is: Automation Research at NBS; Reducing the Risks of Failure; A New Twist on Dating; Results of Soft Aluminum Study Announced; Industry Gas Suppliers to Produce CRM's; New Standard Radiation Source Possible; New Mass Comparator is Quicker, Costs Less, and Data Converter Calibration Service Announced. GRA

N82-16957# Futures Group, Glastonbury, Conn.

RESEARCH INTO TECHNOLOGY OUTPUT MEASURES

Theodore J. Gordon and T. J. Munson Nov. 1380 274 p refs

(Grant NSF SRS-79-11221)

(PB81-245300; Rept-454-46-26R2; NSF-SIU-80-1) Avail: NTIS HC A12/MF A01 CSCL 05A

The problem of measuring state of the art of a technology is dealt with. Some conventions for describing the technological state of the art of essentially any technology are proposed. The rationale for the approach is provided. Two particular technologies: antibiotics and computers are emphasized. GRA

N82-16958# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.

EVALUATION OF THE MOLECULETOR FUEL ENERGIZER UNDER SECTION 511 OF THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT

Gary T. Jones May 1981 121 p refs

(PB81-247942; EPA-AA-TEB-511-81-11) Avail: NTIS HC A06/MF A01 CSCL 13F

Results of an evaluation of a fuel saving device known as the Fuel Energizer Moleculetor are presented. The device is designed to be installed in the fuel line between the fuel tank and fuel pump. The applicant claims that as the fuel passes through the device, it becomes energized, burns more efficiently and therefore, provides improved fuel economy. GRA

N82-16959# Environmental Protection Agency, Ann Arbor, Mich. Office of Mobile Source Air Pollution Control.

EVALUATION OF THE IMPACT ON EMISSIONS AND FUEL ECONOMY OF CONVERTING TWO VEHICLES TO COMPRESSED NATURAL GAS FUEL

Thomas J. Penninga Jun. 1981 18 p

(PB81-245714; EPA-AA-TEB-81-19) Avail: NTIS HC A02/MF A01 CSCL 13F

The EPA was requested by the Department of Energy to perform testing on two late model vehicles which were converted with on-the-market systems to run on compressed natural gas (CNG). The EPA was requested to measure vehicle emissions, fuel economy, and acceleration characteristics of the vehicles in stock configuration, modified running on gasoline, and modified-running on natural gas. The testing was run over a three week period with triplicate tests run in each condition. The results of the testing are reported. It does not attempt to analyze the feasibility of CNG powered vehicles in the market place. GRA

N82-16960# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.

THE EFFECTS OF THE MOLECULETOR FUEL ENERGIZER ON EMISSIONS AND FUEL ECONOMY

Gary T. Jones May 1981 22 p refs

(PB81-244998; EPA-AA-TEB-81-18) Avail: NTIS HC A02/MF A01 CSCL 13F

A program designed to evaluate the effects of the Moleculetor Fuel Energizer on exhaust emissions and fuel economy is described. Three late model passenger cars were subjected to a series of test sequences both before and after installation of the device. Each test sequence included the current Federal Test Procedure (for exhaust emissions only) and the Highway Fuel Economy test. Test vehicles were selected on the basis of high sales volume and were set to manufacturer's specifications before entering the program. Based on the results of this testing, there is no reason to believe that the Molculetor conclusively had an effect on the fuel economy and emission levels of the test vehicles. The changes that were shown were quite small and were not inconsistent with trends found by EPA on other fleets of test vehicles which were subjected to mileage accumulation. GRA

N82-16961# Environmental Protection Agency, Ann Arbor, Mich. Office of Mobil Source Air Pollution Control.

EMISSION AND FUEL ECONOMY OF FUEL-MAX, A RETROFIT DEVICE

F. Peter Hutchins and John T. White May 1981 13 p

(PB81-244162; EPA-AA-TEB-81-15) Avail: NTIS HC A02/MF A01 CSCL 13F

Results of testing the 'FUEL-MAX' device are presented. The FUEL-MAX is an air-bleed device which replaces a vehicle's Exhaust Gas Recirculation (EGR) valve and is claimed to conserve fuel. The purpose of this project was to evaluate the effect of the FUEL-MAX on exhaust emissions and fuel economy. Testing of three typical 1979 model year passenger cars was conducted. The basic test sequence included the Federal Test Procedure (FTP) and the Highway Fuel Economy Test (HFET). Tests were performed before and after installation of the FUEL-MAX. Average hydrocarbon and carbon monoxide emissions decreased somewhat while oxides of nitrogen displayed substantial increases. Fuel economy increased approximately three percent on the FTP but exhibited no change over the HFET. EPA's Office of Enforcement has determined that the FUEL-MAX can violate the anti-tampering provisions of the Clean Air Act. GRA

N82-16962# Environmental Protection Agency, Ann Arbor, Mich. Control Technology Assessment and Characterization Branch.
CARBON MONOXIDE AND NON-FTP (FEDERAL TEST PROCEDURES) AMBIENT TEMPERATURE
Robert I. Bruetsch Feb. 1981 90 p refs
(PB81-243180; EPA/AA/CTAB/TA/81-7) Avail: NTIS HC A05/MF A01 CSCL 13F

The objectives of this report were to summarize the available information regarding motor vehicle emissions under non-FTP temperature conditions, investigate ambient air quality data to determine the extent to which CO emissions must be reduced to achieve ambient air quality standards, evaluate vehicle test data under non-FTP temperature conditions, estimate the difference between in-use vehicle emission levels and certification laboratory emission levels. Conclusions and recommendations based on these objectives were also considered to provide a baseline from which to assess the need for development of regulations or guidelines for motor vehicle operation under non-FTP temperature conditions and future testing procedure revisions.
GRA

N82-16963# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
COMPUTER SIMULATION OF THE EFFECT OF ROAD ROUGHNESS ON TIRE-PAVEMENT FORCES FOR AN ARTICULATED VEHICLE PERFORMING BRAKING AND CORNERING MANEUVERS Phase Report, Sep. 1977 - Apr. 1980
C. S. Kuehne and P. F. Bohn Apr. 1981 95 p refs
(PB81-238461; BCE-V-270; FHWA/RD-80/029) Avail: NTIS HC A05/MF A01 CSCL 13F

An investigation of how road roughness affects the tire-pavement interface for an articulated vehicle was completed. A modified version of the three dimensional vehicle simulation was used to simulate braking and cornering maneuvers for an articulated vehicle on different road surfaces of varying severity. The results of this investigation show that the effects of road roughness are greatest when the vehicle is performing maneuvers near its performance limit. These extreme effects were not manifested for less severe cornering or braking maneuvers that would typically be encountered in nominal driving situations.
GRA

N82-16964# Transportation Systems Center, Cambridge, Mass.
LOS ANGELES DOWNTOWN PEOPLE MOVER (DPM) OPERATIONAL ANALYSIS Final Report, Jul. - Oct. 1979
Arthur S. Priver and Thomas M. Dooley Jun. 1981 40 p
(PB81-241416; DOT-TSC-UMTA-80-4; UMTA-MA-06-0081-81-1) Avail: NTIS HC A03/MF A01 CSCL 13B

The ability of the planned Los Angels Downtown People Mover (DPM) to handle the projected passenger demand for the year 2000 was studied. The question of whether the approximately 100,000 passengers per day in the year 2000 can be handled if the system headway is reduced to 60 seconds was addressed. Train capacities required at different headways to handle the demand with alternative passenger waiting time goals were examined. The approach used to analyze each issue is given, along with the underlying assumptions that were made. The results are then presented and conclusions drawn.
GRA

N82-16965# Booz-Allen and Hamilton, Inc., Philadelphia, Pa. National Analysis, Inc.
CONSUMER ORIENTATIONS TOWARD FUEL EFFICIENT VEHICLES: EXECUTIVE SUMMARY Final Report, Feb. 1978 - Nov. 1980
Robert Kernish Mar. 1981 25 p
(Contract DOT-HS-7-01782)
(PB81-245359; Rept-1-037-78-ES; DOT-HS-805939) Avail: NTIS HC A02/MF A01 CSCL 21G

Consumer reactions both to specific vehicle design changes, and more generally, to the Corporate Average Fuel Economy (CAFE) regulations were investigated. The energy supply situation which motivated their implementation is also discussed in terms of consumer reactions.
M.D.K.

N82-16966# Booz-Allen and Hamilton, Inc., Philadelphia, Pa. National Analysts, Inc.
CONSUMER ORIENTATIONS TOWARD FUEL EFFICIENT VEHICLES Final Report, Feb. 1978 - Nov. 1980
Robert Kernish Mar. 1981 118 p
(Contract DOT-HS-7-01782)
(PB81-245367; Rept-1-037-78-F; DOT-HS-805938) Avail: NTIS HC A06/MF A01 CSCL 21G

Consumer reactions to the energy supply situation and to the Corporate Average Fuel Economy (CAFE) regulations were considered. Reactions to specific vehicle design changes were also investigated and are summarized.
M.D.K.

88 SPACE SCIENCES (GENERAL)

N82-16967# Astronomische Gesellschaft, Hamburg (West Germany).
ASTRONOMICAL SOCIETY INFORMATION NO. 50. REPORTS OF THE SCIENTIFIC MEETINGS
1980 176 p refs Partly in GERMAN and ENGLISH Meetings held at Bochum, West Germany, 12-14 Mar. 1979 and Mainz, West Germany, 5-7 Mar. 1980
(Rept-50; ISSN-0374-1958) Avail: NTIS HC A09/MF A01

Topics considered include: (1) the dynamics of molecular gas in the galactic center, (2) the galactic center and Aquila regions near infrared, (3) a Fokker-Planck model for the stellar initial mass function, (4) far-infrared balloon-borne observatories, (5) the hydrostatic equilibrium of interstellar gas and magnetic fields in the 6 kpc region of the Galaxy, (6) solar rotation and activity in the past and their possible influence upon the evolution of life, and (7) the generation of spiral waves in galaxies. For individual titles, see N82-16968 through N82-16974.

N82-16968# Astronomische Gesellschaft, Hamburg (West Germany).
A FOKKER-PLANCK MODEL FOR THE STELLAR INITIAL MASS FUNCTION c90
H. Zinnecker, S. Drapatz, and R. Cowsik *In its* Astron. Soc. Inform. No. 50 1980 p 64-68 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

A statistical model for distribution function for the masses of stars at birth, i.e., the Initial Mass Function, is presented. The interaction of an ensemble of quasistatic fragments (preprotostars) with their parent cloud is studied. The nuclei of fragmentation, being in magnetogravitational equilibrium, accrete material from their gaseous surroundings for an extended period until they start to collapse dynamically. A log-normal mass spectrum of fragments developed during this accretion period is shown.
N.W.

N82-16969# Astronomische Gesellschaft, Hamburg (West Germany).
THE GALACTIC CENTRE AND AQUILA REGIONS IN THE NEAR INFRARED c89
A. W. Harris, W. Hofmann, and D. Lemke *In its* Astron. Soc. Inform. No. 50 1980 p 75-76 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

Observations at 2.4 microns in the near infrared with large field-of-view (approx. 1 deg) balloon-borne telescopes to provide insight to the large scale structures of the inner region of the Galaxy are summarized. Irregularities in the density of obscuring interstellar material in front of the bright Galactic center region are given in possible explanation of the 2.4 micron features. A mass to luminosity ratio for the central bulge of the Galaxy of 4.0 is estimated. Sharp decreases in 2.4 micron emission in the Galactic plane just beyond $l = 30$ deg and $l = 50$ deg are observed, suggesting sudden decreases in stellar density at these longitudes. A 5 GHz scan of this region was carried out, but no corresponding radio source was found. The nature of this source, therefore, remains unknown.
N.W.

N82-16970# Astronomische Gesellschaft, Hamburg (West Germany).
THE DYNAMICS OF MOLECULAR GAS IN THE GALACTIC CENTER **c90**
R. Guesten and D. Downes *In its* Astron. Soc. Inform. No. 50 1980 p 76-79 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

Results of a 6 cm H2CO survey in the galactic center region are briefly summarized. Three giant molecular clouds at velocities of + 20, + 40, and + 25 km/s were seen in absorption against the continuum sources of the galactic center region. The high hydrogen-to-formaldehyde column density in the 20 km/s cloud yields 2.2 microns extinction of 5 < A sub 2.2 microns < 10 magnitudes. The H2CO maps and the submillimeter and HCN observations are compared, indicating that the + 40 km/s cloud lies on the far side of the galactic center between Sgr A West and Sgr A East. Stabilizing the clouds against tidal disruption is explained. N.W.

N82-16971# Observatorium Hoher List, Bonn (West Germany).
SOLAR ROTATION AND ACTIVITY IN THE PAST AND THEIR POSSIBLE INFLUENCE UPON THE EVOLUTION OF LIFE **c92**
E. H. Geyer *In* Astronomische Gesselschaft Astron. Soc. Inform. No. 50 1980 p 101-104 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

Observations of enhanced spot active main sequence stars of solar type led to the formulation of the hypothesis which states that the rotational angular momentum, J sub r, of stars with spectral types later than F5 determines the intensity of their magnetic activity, bar A. Such very spot active stars are exclusively found as the components of fairly close binary stars, and show rotation periods smaller or more or less synchronous to the orbital period. Single stars of the lower main sequence are generally slow rotators, and do not show detectable activity in optical spectral regions, similar to the Sun if observed from stellar distances. Author

N82-16972# Astronomische Gesellschaft, Hamburg (West Germany).
FAR INFRARED BALLOON-BORNE OBSERVATIONS **c89**
S. Drapatz, L. Haser, R. Hofmann, and H. Rothermel *In its* Astron. Soc. Inform. No. 50 1980 p 109-115 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

The Infrared Balloon Gondola developed at the institute was flown successfully (pointing stability achieved + or - 15 arcsec). Photometric observations (lambda > 50 microns) of the central region of the Milky Way (Sgr B2) and of another Galaxy (M 101) were carried through with high spatial resolution (beam width 1.4 arcmin obtained by the observation of Saturn). A three-axis stabilized balloon-gondola, developed for a 1-meter telescope to perform far infrared spectroscopy of astronomical sources, is discussed. In a first step this gondola was flown with a 40 cm telescope and a photometry-experiment. The main purpose of this flight (7 hrs at appox. 35 km float altitude) was to test the performance of the new balloon system with a payload which represents future experiments with the 1-m mirror in all essential details (mass distribution, power, etc). At the same time some photometry observations in the far infrared region were carried through. Author

N82-16973# Astronomische Gesellschaft, Hamburg (West Germany).
THE HYDROSTATIC EQUILIBRIUM OF INTERSTELLAR GAS AND MAGNETIC FIELDS IN THE 6kpc REGION OF THE GALAXY **c90**
B. Fuchs, H. Spreckels, and K. O. Thielheim *In its* Astron. Soc. Inform. No. 50 1980 p 156-160 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

A two-component gas model is applied to the vertical hydrogen distribution in the 6 kpc region of the Galaxy. Galactic gravitational field and interstellar magnetic field determination of the dynamics of interstellar gas is reviewed. N.W.

N82-16974# Astronomische Gesellschaft, Hamburg (West Germany).
THE GENERATION OF SPIRAL WAVES IN GALAXIES **c90**
K. O. Thielheim *In its* Astron. Soc. Inform. No. 50 1980 p 161-164 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A02/MF A01

The literature of 'gravitational' density wave theory is reviewed. The theory's basic assumption, that the spiral pattern is generated by the mutual gravitational interaction of stars inside stellar disks, is examined. N-body simulations were performed. The gravitational field inside the fictitious galaxy was determined by a central oval mass distribution, which was allowed to increase slowly with time as by accretion of stars from the surrounding disk. The gravitational field was determined by an axial symmetric background, consistent with the initial mass distribution of stars inside the disk. Nevertheless, long-living spiral shaped trailing density waves were found again. It is conjectured that the oval shaped equilbrium configuration found in N-body simulation is what is otherwise observed as elliptical galaxies. N.W.

N82-16975# Astronomische Gesellschaft, Hamburg (West Germany).
ASTRONOMICAL SOCIETY INFORMATION NUMBER 51. REVIEW ARTICLES 2
1981 172 p refs Partly in GERMAN; partly in ENGLISH (Rept-51; ISSN-0374-1958) Avail: NTIS HC A08/MF A01

Evolutionary processes within the solar system are addressed. Evidence for these processes found in meteorite composition, gravitational collapse theory, tidal friction in the Earth-Moon system, and mass transfer in stars are among the topics discussed. For individual titles, see N82-16976 through N82-16985.

N82-16976# Max-Planck-Institut fuer Chemie, Mainz (West Germany).
ISOTOPIC ANOMALIES AND THE EARLY HISTORY OF THE SOLAR SYSTEM **c90**
Friedrich Begemann *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 49-62 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

Isotopic heterogeneities found in carbonaceous chondrites are discussed in some detail. Specifically, three elements are considered: (1) inclusions from carbonaceous chondrites contain quite normal minerals where the oxygen is enriched by up to 5% in 16O; (2) the xenon in acid unsoluble residues from carbonaceous chondrites contains at least two distinct anomalous components; and (3) neon being more than 99% pure Ne is most convincingly accounted for by in situ decay of 2.6a Na which implies a condensation of Na bearing host phases within ten years or so of the production of Na. J.M.S.

N82-16977# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
FORMATION OF THE PLANETARY SYSTEM **c90**
H. J. Volk *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 63-80 refs (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

The formation of planets by gravitational fragmentation of a flattened rotating solar nebula by collisional coagulation in a cool gas/dust mixture, or by recondensation and coagulation out of a hot vaporized state of the preplanetary material is discussed. The cool formation appears as the most attractive mechanism, whereas significant arguments from planetary observations and cosmochemistry can be brought forward against the two other possibilities, even if they are supported by very serious ideas. It is concluded that turbulent angular momentum and mass transport must play an important role in planet formation. Analytical estimates for the development of the dust component under these conditions suggest this cool formation to be possible within major constraints. At present the different processes are identified and reasonably carefully worked out individually, but they need to be put into a self consistent approximate model. J.M.S.

N82-16978# Bonn Univ. (West Germany).
TIDAL FRICTION IN THE EARTH-MOON SYSTEM **c90**

Peter Brosche *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 81-102 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

A deceleration of the Earth's rotation and also a deceleration in the mean orbital angular velocity of the moon is deduced. From ancient solar elipses, transits of Mercury, Lunar laser, Ranging and the growth rhythms of fossil animals is discussed. The corresponding decrease in the Earth's angular momentum and the increase in the angular momentum of the lunar orbit match each other. Therefore, both seem to be expressions of one and the same interaction. Of several possibilities, tidal friction connected with oceanic tides appears to be the most plausible candidate for this interaction process. Oceanographic computations reproduce the observed value of tidal friction. This provides a possible way out of the dilemma of schematic backward integrations - to reach a narrow situation between Earth and Moon. Characteristic numerical values of tidal friction are expressed by several parameters. J.M.S.

N82-16979# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
EARLY PHASES OF STELLAR FORMATION c90
Verner M. Tscharmuter *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 103-116 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

Processes that promote gravitational collapse and star formation in interstellar clouds are discussed. For example, the increase of the external pressure by passing through the galactic shock, or by compression due to an expanding HII region, supernova shell, etc., may cause a cloud to become gravitationally unstable. Obstacles to star formation are mentioned: thermal pressure, angular momentum, magnetic fields. Processes are proposed to solve the angular momentum problem. In addition to magnetic braking of rotating clouds, magnetic fields are shown to stabilize clouds very effectively. From these properties some speculative conclusions concerning the initial conditions for the presolar nebula and the formation of the cometary cloud are drawn. Numerical examples carried out for self gravitating flows in two and three spatial dimensions are given. They indicate the possibility of converting a cloud's spin into orbital angular momentum by a special fragmentation process. Thus the angular momentum problem is solved by the formation of a binary (or multiple) stellar system. Models including angular momentum transport by turbulent friction and then application to the theoretical evolution of the solar nebula are also briefly mentioned. J.M.S.

N82-16980# Astronomical Inst., Utrecht (Netherlands). Space Research Lab.
MASS LOSS FROM EARLY TYPE STARS c90
Henny J. G. L. M. Lamers *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 117-122 refs (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

Early type stars are losing mass at a rate sufficiently large enough to affect their evolution. The determination of the mass loss rates, the dependence of mass loss on the stellar parameters, the structure of the stellar wind and the origin of the mass loss are discussed. J.M.S.

N82-16981# Amsterdam Univ. (Netherlands). Astronomical Inst.
THE FORMATION OF COMPACT OBJECTS IN BINARY SYSTEMS c90
E. P. J. vandenHeuvel *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 121-122 (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

The observational evidence on compact objects in binary systems is summarized. Apart from the massive and the low-mass X-ray binaries, three binary radio pulsars are now known, PSR 1913 + 16, PSR 0656 + 64, and PSR 0820 + 02. The various ways in which compact objects can be formed in interacting binary systems are outlined. Massive interacting binary systems are, after the first phase of mass transfer expected to leave either: (1) Wolf-Rayet binaries, with a wide range of orbital periods, as a result of quasi-conservative mass transfer; or (2) systems with short orbital periods as remnants of highly nonconservative evolution (spiral-in during the first phase of mass transfer). From the fact that over 2/3 of all mass stars are members of binaries with $P < \text{or} = 10$ yrs, it is argued that over 2/3 of all single pulsars are expected to have high runaway velocities, since they originate from disrupted post-spiral-in systems. J.M.S.

N82-16982# Observatorium Hoher List, Daun (West Germany).
WOLF-RAYET STARS WITH COMPACT COMPANIONS c89
Wilhelm Seggewiss *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 123-138 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

The spectral characteristics of the Wolf-Rayet (WR) stars are discussed. It is stressed that central hydrogen and helium absorption lines do not necessarily prove the binary nature of the WR star but might indicate the presence of intrinsic photospheric lines. A short summary of the main physical data of the WR stars is given. The consensus on the effective temperatures tends to stabilize at the lower limit of earlier determinations, i.e., near 30000 K corresponding to the temperature of O9 V stars. The luminosities are quite high, whereas the masses are normally in the range of only 10 solar masses. During its life a massive OB binary may undergo two Wolf-Rayet phases. The first phase will occur after Roche lobe overflow (or stellar wind mass loss) when the hydrogen rich layers are transported to the companion or lost from the stellar system and nuclear processed material is exposed. A second phase may occur when the primary star has already ended its life as a compact object (after supernova explosion) while the former secondary develops into WR star. A number of observational arguments are discussed which show that the six WR binaries with small mass functions are just in the second WR phase, i.e., are candidates for binaries with compact secondaries. J.M.S.

N82-16983# Astronomical Inst., Utrecht (Netherlands).
MAGNETIC ACTIVITY IN COOL STARS c90
Cornelis Zwaan *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 139-142 ref (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

The solar magnetic structure is discussed as a framework for stellar magnetism. Ways of observing magnetic structure in cool stars are outlined with emphasis on observations of Ca 2, H, and K emission in main sequence stars. It is inferred that the chromospheric, transition-region, and coronal emissions are correlated manifestations of magnetic activity in stars with convective envelopes, and that the main level of activity depends on the rotation rate. J.M.S.

N82-16984# Bonn Univ. (West Germany). Radioastronomisches Inst.
GALAXIES IN THE LIGHT OF THE 21 cm LINE c90
Ulrich Mebold and Klaus Reif *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 143-158 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

Correlations between the observable integral parameters of galaxies are investigated for a sample of 114 galaxies. A statistical component analysis is applied to integral parameters of galaxies. The results are discussed. J.M.S.

N82-16985# Ruhr Univ., Bochum (West Germany). Astronomisches Inst.
STRUCTURE AND DYNAMICS OF THE LARGE MAGELLANIC CLOUD c90
J. V. Feitzinger *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 159-174 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

The basic kinematics and dynamics of the Large Magellanic Cloud are deduced. Three main disturbances are found: a warp of the southern side of the Large Magellanic Cloud, streaming

motions in and around the bar, and streaming motions in the 30 Doradus region. By comparison of eight mass models, taking into account thickness effects and controlled by surface photometric data, the mass of the Large Magellanic Cloud is found to be (5 + or - 1) 10 to the 9th power solar mass. Dynamically the Large Magellanic Cloud is described by a dominating disk potential with an additional bar potential as a disturbance. The stochastic self-propagating star formation model is applied to the Large Magellanic Cloud. Numerical simulations produce large, irregular, and symmetric regions of massive stars which form partially ordered structures on the scale of the whole galaxy, including spiral arm filaments. The simulations also generate tremendous perturbations in the gaseous component of the Large Magellanic Cloud, the most dramatic being large holes and shells, for which there is observational evidence.
J.M.S.

N82-16986# Astronomische Gesellschaft, Hamburg (West Germany).
ASTRONOMICAL SOCIETY INFORMATION NO. 52. REPORT OF THE MEETING [MITTEILUNGEN DER ASTRONOMISCHEN GESELLSCHAFT NR. 52. BERICHT UEBER DIE VERSAMMLUNG]
1981 173 p refs Meeting held at Muenster, West Germany, 22-25 Sep. 1980
(ISSN-0374-1958) Avail: NTIS HC A08/MF A01

Observations of star clusters, quasars, and galaxies are presented. Topics include: stellar evolution, formation of disks of interstellar gases, nuclear activity in star clusters, analysis of stellar spectra, development of photometers, infrared excesses and ultraviolet excesses, and distribution of stars in the galactic halo. For individual titles, see N82-16987 through N82-17000.

N82-16987# Astronomische Gesellschaft, Hamburg (West Germany).
HIGH RESOLUTON IUE OBSERVATIONS OF THE MG II RESONANCE LINES IN THE T TAURI STAR S CrA c89
C. Bertout Appenzeller, R. Munt, and J. Krautter *In its* Astron. Soc. Inform. No. 52 1981 p 15-17 refs Sponsored in part by Deutsche Forscungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

The star's visual brightness was recorded as m sub V = 12.13 and B-V = +0.99. A tube spectrogram shows somewhat stronger emission lines than normal in the blue spectral range (relative to the continuum). Pronounced YY Orionis profiles at all higher Balmer lines starting at H sub delta are reported. T.M.

N82-16988# Astronomische Gesellschaft, Hamburg (West Germany).
STAR POPULATIONS IN THE GALACTIC HALO c89
Roland Buser and Liang-Tai George Chiu *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 52 1981 p 40-45 refs Sponsored in part by the Swiss National Science Foundation and NSF (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Proper motions and photographic RGUBV-photometry of faint field stars in SA 51 and SA 57 were used to investigate the stellar populations in the galactic halo. The individual stars were classified into populations according to two independent statistical methods: the reduced proper motion diagram, and the U-G, G-R two-color diagram of Becker's RGU system. The kinematically and photometrically determined populations are compared and the potentials and limitations of the RGU-photometric approach to the study of the galactic halo are discussed. T.M.

N82-16989# Astronomische Gesellschaft, Hamburg (West Germany).
TEMPERATURE CHANGE, PERIOD/AMPLITUDE RELATION FOR CLASSICAL CEPHEIDS c89
Eric W. Elst *In its* Astron. Soc. Inform. No. 52 1981 p 52-55 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Plots of color temperature change against ratio period/amplitude are presented. The plots show a linear relation for a set of stars from which it is assumed that they are pulsating in the first overtone. Higher modes of pulsation for several stars were determined. T.M.

N82-16990# Astronomische Gesellschaft, Hamburg (West Germany).
IUE OBSERVATIONS OF A NEW BL LAC OBJECT FROM THE S5 RADIO CATALOGUE c89
K. J. Fricke, W. Kollatschny, H. Schleicher, and H. W. Yorke *In its* Astron. Soc. Inform. No. 52 1981 p 61-62 ref (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Low resolution UV spectra of Kuhr A were obtained in the wavelength regions 2000-3000 A and 2000-1100 A. The detection limit for emission lines was estimated to be approx. equally to 10 to the minus 13th power erg/sec/sq cm. T.M.

N82-16991# Astronomische Gesellschaft, Hamburg (West Germany).
OPTICAL AND ULTRAVIOLET SPECTRA OF SEYFERT GALAXIES c89
K. J. Fricke, W. Kollatschny, H. Schleicher, and H. W. Yorke *In its* Astron. Soc. Inform. No. 52 1981 p 62-64 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Using the IUE satellite, low resolution UV spectra from the Seyfert galaxies NGC 1566, NGC 7603, Akn 120, and Mkn 3 were obtained. The first two objects were observed only in the short wavelength region 1100 - 2000 A, the other two also in the long wavelength region 2000 - 3000 A. The IDS spectra were reduced using the standard ESO software. Both the optical and UV spectra were corrected for interstellar extinction in our galaxy and E sub B-V values were derived from 21 cm maps. T.M.

N82-16992# Astronomische Gesellschaft, Hamburg (West Germany).
SIMULTANEOUS IUE AND OPTICAL OBSERVATIONS OF THE SHORT PERIOD SPOT ACTIVE BINARY XY URSAE MAJORIS c89
E. H. Geyer and M. Hoffmann *In its* Astron. Soc. Inform. No. 52 1981 p 70-71 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

A total of 6 UV spectra in the long wavelength range and the 6A resolution mode were obtained during the orbital phase interval 0.4 to 0.95. In addition to these IUE observations, ground based pe observations with a typical time resolution of 40s were carried out using a double beam photometer. Discussion of these two almost simultaneous observations is summarized.
T.M.

N82-16993# Astronomische Gesellschaft, Hamburg (West Germany).
THE MASS (STAR NUMBER)-RADIUS RELATIONS FOR THE CLUSTERS OF THE LARGE MAGELLANIC CLOUD c90
E. H. Geyer and U. Hopp *In its* Astron. Soc. Inform. No. 52 1981 p 71-74 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Effective cluster radii (stellar radii) and the total numbers of member stars (N sub a) within these radii were obtained from star counts on B- and V-Eso Schmidt plates for 12 open-, 5 blue-, and 4 red globular clusters of the large Magellanic Cloud. There exist two linear relations between log N sub a and log stellar radii separately for the open- and the globular clusters, but with identical slopes. T.M.

N82-16994# Astronomische Gesellschaft, Hamburg (West Germany).
NON-STATIONARY VISCOUS GASEOUS DISKS IN NUCLEI OF DENSE STELLAR SYSTEMS c90
W. Glatzel and K. J. Fricke *In its* Astron. Soc. Inform. No. 52 1981 p 74-75 Sponsored in part by the German Science Foundation (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Evolutionary mass loss from stars and the production of gas in stellar collisions within a rotating star cluster leads to the formation of a gaseous disk at the center if the cooling of the gas is sufficiently fast. It is concluded that due to the time scales involved the disk cannot have reached a stationary state

during the Hubble time. The outer region of the disk is dominated by pure mass inflow. In the center the density grows exponentially with time. This growth is universal and it may be indicative for the formation of a compact object at the center. T.M.

N82-16995# Astronomische Gesellschaft, Hamburg (West Germany).
EQUILIBRIUM AND STABILITY OF ROTATING STELLAR CORES WITH FINITE ENTROPY c90
W. Glatzel, K. J. Fricke, and M. ElEid *In its* Astron. Soc. Inform. No. 52 1981 p 75-76 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

The thermodynamical and mechanical structure of fast spinning cores of evolved massive stars is important for the processes of supernova explosion, pulsar formation, and gravitational radiation emission during core collapse. Marginally unstable configurations were established according to the present knowledge on the thermodynamic structure of evolved stellar cores assuming Maclaurin spheroids for the description of the rotational state. T.M.

N82-16996# Astronomische Gesellschaft, Hamburg (West Germany).
INFRARED-EXCESS OF PECULIAR B- AND A-STARS c89
D. Groote and J. P. Kaufmann *In its* Astron. Soc. Inform. No. 52 1981 p 82-84 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Results show that the measured infrared-excess appears to be a common phenomena for all spectral types from at least BO to FO. Excess always appears when there is a minimum in the u-brightness, so that at least part of the radiation absorbed in the u-band is remitted from circumstellar gas probably by free-free emission. T.M.

N82-16997# Astronomische Gesellschaft, Hamburg (West Germany).
EVOLUTION AND NUCELOSYNTHESIS OF MASSIVE POP 111 STARS c90
W. W. Ober, M. ElEid, and K. J. Fricke *In its* Astron. Soc. Inform. No. 52 1981 p 118-119 refs Sponsored in part by the German Science Foundation (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Observations of the oldest stars in the galactic halo and in metal-deficient globular clusters show evidence of heavy elements in their atmospheres. The enrichment of primordial material with heavy elements in a pregalactic phase by massive stars was calculated. Results are presented which may be adduced for the interpretation of heavy element abundances in old stars, high redshift quasars, and intergalactic X-ray clusters. T.M.

N82-16998# Astronomische Gesellschaft, Hamburg (West Germany).
THE NEW OPTICAL (300 nm LESS THAN LAMBDA LAMBDA LESS THAN 1000 nm) ESO PHOTOMETER c74
G. F. O. Schnur *In its* Astron. Soc. Inform. No. 52 1981 p 128-130 (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

The photometer provides the following optical possibilities: large field viewing, necessary for acquisition of the objects; slit viewing, to be used in combination with the reflecting inclined slitjaws of spectrographs for guiding on the slit; and as main element, an integrating TV system. The disaphragm wheel of the photometer was placed on top of all other elements and inclined by the same amount as the slitjaws of the spectrographs are. T.M.

N82-16999# Astronomische Gesellschaft, Hamburg (West Germany).
NUCLEAR ACTIVITY IN SO, SBO - GALAXY NUCLEI c90
G. F. O. Schnur and W. A. Sherwood *In its* Astron. Soc. Inform. No. 52 1981 p 130-131 (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Thirty-five galaxies were surveyed. Results show that 10 galaxies (29%) show pure-absorption line spectra. In 10 galaxies (29%) the Balmer Lines were detected indicating physical conditions that are difficult to be explained by H II-region like phenomena. T.M.

N82-17000# Astronomische Gesellschaft, Hamburg (West Germany).
THE 1 MM OBSERVATIONS OF OPTICALLY SELECTED QUASARS c89
W. A. Sherwood, E. Kreysa, and G. V. Schultz *In its* Astron. Soc. Inform. No. 52 1981 p 138-140 refs Sponsored in part by DFG/SFB (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

Using the prime focus of a 3.6 m telescope and a composite bolometer operating at a wavelength of 1 mm three samples of objects identified as quasars in optical surveys were observed and confirmed with slit spectra. The UV excess and/or emission lines, and redshift characteristics are discussed. T.M.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-17001*# Alabama Univ. in Huntsville.
X-RAY ASTRONOMY INSTRUMENTATION STUDIES Final Report
John C. Gregory Nov. 1981 6 p refs
(Contract NAS8-33977)
(NASA-CR-161948) Avail: NTIS HC A02/MF A01 CSCL 03A

Preliminary designs were made for a multiplane, multiwire position sensitive proportional counter for X-ray use. Anode spacing was 2 mm and cathode spacing 1 mm. Assistance was provided in setting up and operating two multiwire proportional counters, one with 5 mm anode spacing, and the other with 2 mm spacing. Argon-based counter gases were used for preliminary work in assembling a working experimental system to measure xenon fluorescence yields. The design and specification of a high purity gas filling system capable of supplying mixtures of xenon and other gases to proportional counters was also performed. The system is mounted on a cart, is fully operational, and is flexible enough to be easily used as a pumping station for other clean applications. When needed, assistance was given to put into operation various computer-related pieces of equipment. A.R.H.

N82-17002*# California Inst. of Tech., Pasadena.
FABRICATION OF X-RAY TELESCOPES FOR SOUNDING ROCKET FLIGHTS Final Report
11 Sep. 1981 21 p refs
(Grant NGR-05-002-284)
(NASA-CR-165112) Avail: NTIS HC A02/MF A01 CSCL 03A

Two X-ray telescopes and two detector systems were fabricated, and one of the telescopes (15 in. diameter, Wolter type I telescope) was flown on two sounding rocket flights. The telescopes were fabricated using the diamond point technique which provided the accurate figure of the mirrors to about a focal plane blur of 0.5 arc minutes. The 15 in. telescope mirrors were polished using standard polishing techniques to remove tooling marks from the diamond turning, then chemically polished to bring the X-ray reflectivity up to nearly the theoretical values. The optical image formed by the 15 in. telescope was found to produce a blur of about 40 arc seconds for a parallel beam of incoming laser light. The first flight of the telescope produced an X-ray image of Capella which indicated that the X-ray image was blurred to the extent of about 2 arc minutes. This additional image degradation was due to a slight error in focusing the X-ray image onto the detector. S.L.

N82-17003# California Univ., Santa Cruz. Board of Studies in Astronomy and Astrophysics.
THERMONUCLEAR MODEL FOR GAMMA-RAY BURSTS
Stanford E. Woosley 26 Aug. 1981 23 p refs Presented at the Workshop on Gamma Ray Transients and Related Astrophys.

Phenomena, La Jolla, Calif., 5-8 Aug. 1981 Submitted for publication Prepared in cooperation with Calif. Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-48; Grants NSF AST-79-09102; NSF AST-81-08509)
(DE81-030835; UCRL-86611; CONF-810871-2) Avail: NTIS HC A02/MF A01

The evolution of magnetized neutron stars with field strengths of approx. 10 to the 12th power gauss that are accreting mass onto kilometer-sized polar regions at a rate of approx 10 to the 13th power solar mass/yr is examined. Based on the results of one dimensional calculations, one finds that stable hydrogen burning, mediated by the 'hot' CNO-cycle, will lead to a critical helium mass in the range 10 to the 20th to 22nd power g km(-2). Owing to the extreme degeneracy of the electron gas providing pressure support, helium burning occurs as a violent thermonuclear runaway which may propagate either as a convective deflagration or as a detonation wave. Complete combustion of helium into (56)Ni pushes hot plasma above the surface of the neutron star. Rapid expansion of the plasma channels a substantial fraction of the explosion energy into magnetic field stress. The hard gamma-outburst of several seconds softens as the event proceeds and is followed by a period, typically of several minutes duration, of softer X-ray emission as the subsurface ashes of the thermonuclear explosion cool. DOE

N82-17004# California Univ., Livermore. Lawrence Livermore Lab.
THE 3-D ON THE 7600-STAR-CRAY
V. Kransky 17 Sep. 1981 18 p Presented at the CRAY User Conf., Schliersee, West Germany, 28 Sep. - 1 Oct. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-030889; UCRL-96693; CONF-810960-1) Avail: NTIS HC A02/MF A01

COM3 is a large three dimensional Eulerian Program (over 2500 vector flops per cycle) which was formulated to make use of vectors entirely (> 99%). COM3 was programmed to make use of Class VI computers efficiently and achieves Class VI high performance execution rates on both the Star and Cray computers (28 to 32 megaflops net rate). A comparison of the COM3 performance on the 7600, Star and Cray computers is given with emphasis on how the program achieved its current execution rate on the Cray. DOE

N82-16102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIO ASTRONOMY
R. D. Shaffer, G. S. Levy, H. C. Wilck, M. J. Grimm, S. Gulkis, T. B. Kuiper, and E. T. Olsen *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 1-3 (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 03A

N82-16969# Astronomische Gesellschaft, Hamburg (West Germany).
THE GALACTIC CENTRE AND AQUILA REGIONS IN THE NEAR INFRARED
A. W. Harris, W. Hofmann, and D. Lemke *In its* Astron. Soc. Inform. No. 50 1980 p 75-76 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

N82-16972# Astronomische Gesellschaft, Hamburg (West Germany).
FAR INFRARED BALLOON-BORNE OBSERVATIONS
S. Drapatz, L. Haser, R. Hofmann, and H. Rothermel *In its* Astron. Soc. Inform. No. 50 1980 p 109-115 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

N82-16982# Observatorium Hoher List, Daun (West Germany).
WOLF-RAYET STARS WITH COMPACT COMPANIONS
Wilhelm Seggewiss *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 123-138 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16987# Astronomische Gesellschaft, Hamburg (West Germany).
HIGH RESOLUTON IUE OBSERVATIONS OF THE MG II RESONANCE LINES IN THE T TAURI STAR S CrA
C. Bertout Appenzeller, R. Munt, and J. Krautter *In its* Astron. Soc. Inform. No. 52 1981 p 15-17 refs Sponsored in part by Deutsche Forscungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16988# Astronomische Gesellschaft, Hamburg (West Germany).
STAR POPULATIONS IN THE GALACTIC HALO
Roland Buser and Liang-Tai George Chiu *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 52 1981 p 40-45 refs Sponsored in part by the Swiss National Science Foundation and NSF (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16989# Astronomische Gesellschaft, Hamburg (West Germany).
TEMPERATURE CHANGE, PERIOD/AMPLITUDE RELATION FOR CLASSICAL CEPHEIDS
Eric W. Elst *In its* Astron. Soc. Inform. No. 52 1981 p 52-55 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16990# Astronomische Gesellschaft, Hamburg (West Germany).
IUE OBSERVATIONS OF A NEW BL LAC OBJECT FROM THE S5 RADIO CATALOGUE
K. J. Fricke, W. Kollatschny, H. Schleicher, and H. W. Yorke *In its* Astron. Soc. Inform. No. 52 1981 p 61-62 ref (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16991# Astronomische Gesellschaft, Hamburg (West Germany).
OPTICAL AND ULTRAVIOLET SPECTRA OF SEYFERT GALAXIES
K. J. Fricke, W. Kollatschny, H. Schleicher, and H. W. Yorke *In its* Astron. Soc. Inform. No. 52 1981 p 62-64 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16992# Astronomische Gesellschaft, Hamburg (West Germany).
SIMULTANEOUS IUE AND OPTICAL OBSERVATIONS OF THE SHORT PERIOD SPOT ACTIVE BINARY XY URSAE MAJORIS
E. H. Geyer and M. Hoffmann *In its* Astron. Soc. Inform. No. 52 1981 p 70-71 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16996# Astronomische Gesellschaft, Hamburg (West Germany).
INFRARED-EXCESS OF PECULIAR B- AND A-STARS
D. Groote and J. P. Kaufmann *In its* Astron. Soc. Inform. No. 52 1981 p 82-84 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-17000# Astronomische Gesellschaft, Hamburg (West Germany).
THE 1 MM OBSERVATIONS OF OPTICALLY SELECTED QUASARS
W. A. Sherwood, E. Kreysa, and G. V. Schultz *In its* Astron. Soc. Inform. No. 52 1981 p 138-140 refs Sponsored in part by DFG/SFB (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-17005 Academy of Sciences (USSR), Moscow.
THE EVOLUTION OF DENSITY PERTURBATION IN AN OPEN UNIVERSE
I. K. Rozgacheva 1981 32 p refs Submitted for publication (Rept-670) Copyright. Avail: Issuing Activity

The evolution of density perturbations in an open Universe is considered. Numerical computations take into account the presence of the microwave background radiation and massless weakly interacting particles. It is shown that in the case of an open Universe omega H(2) < 0.3 observational data contradict modern theories of the formation of galaxies. M.G.

N82-17006# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SUBROUTINES FOR CELESTIAL MECHANICS AND ORBIT GENERATION [ROTINAS AUXILIARES DE MECANICA CELESTE E GERACAO DE ORBITA]
Helio Koiti Kuga, Valdemir Carrara, and Valder Matos DeMadeiros Jul. 1981 38 p refs In PORTUGUESE; ENGLISH summary (INPE-2180-RPE/392) Avail: NTIS HC A03/MF A01

Frequently calculated parameters in celestial mechanics and orbital dynamics are numerically treated. The subroutines are optimized in terms of the input-output parameters, methods used, and internal computations. The objectives of the subroutines and the input-output parameters are described. J.D.H.

N82-16968# Astronomische Gesellschaft, Hamburg (West Germany).
A FOKKER-PLANCK MODEL FOR THE STELLAR INITIAL MASS FUNCTION
H. Zinnecker, S. Drapatz, and R. Cowsik *In its* Astron. Soc. Inform. No. 50 1980 p 64-68 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

N82-16970# Astronomische Gesellschaft, Hamburg (West Germany).
THE DYNAMICS OF MOLECULAR GAS IN THE GALACTIC CENTER
R. Guesten and D. Downes *In its* Astron. Soc. Inform. No. 50 1980 p 76-79 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

N82-16973# Astronomische Gesellschaft, Hamburg (West Germany).
THE HYDROSTATIC EQUILIBRIUM OF INTERSTELLAR GAS AND MAGNETIC FIELDS IN THE 6kpc REGION OF THE GALAXY
B. Fuchs, H. Spreckels, and K. O. Thielheim *In its* Astron. Soc. Inform. No. 50 1980 p 156-160 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

N82-16974# Astronomische Gesellschaft, Hamburg (West Germany).
THE GENERATION OF SPIRAL WAVES IN GALAXIES
K. O. Thielheim *In its* Astron. Soc. Inform. No. 50 1980 p 161-164 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A02/MF A01

N82-16976# Max-Planck-Institut fuer Chemie, Mainz (West Germany).
ISOTOPIC ANOMALIES AND THE EARLY HISTORY OF THE SOLAR SYSTEM
Friedrich Begemann *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 49-62 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16977# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
FORMATION OF THE PLANETARY SYSTEM
H. J. Volk *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 63-80 refs (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16978# Bonn Univ. (West Germany).
TIDAL FRICTION IN THE EARTH-MOON SYSTEM
Peter Brosche *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 81-102 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16979# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
EARLY PHASES OF STELLAR FORMATION
Verner M. Tscharmuter *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 103-116 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16980# Astronomical Inst., Utrecht (Netherlands). Space Research Lab.
MASS LOSS FROM EARLY TYPE STARS
Henny J. G. L. M. Lamers *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 117-122 refs (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16981# Amsterdam Univ. (Netherlands). Astronomical Inst.
THE FORMATION OF COMPACT OBJECTS IN BINARY SYSTEMS
E. P. J. vandenHeuvel *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 121-122 (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16983# Astronomical Inst., Utrecht (Netherlands).
MAGNETIC ACTIVITY IN COOL STARS
Cornelis Zwaan *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 139-142 ref (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16984# Bonn Univ. (West Germany). Radioastronomisches Inst.
GALAXIES IN THE LIGHT OF THE 21 cm LINE
Ulrich Mebold and Klaus Reif *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 143-158 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16985# Ruhr Univ., Bochum (West Germany). Astronomisches Inst.
STRUCTURE AND DYNAMICS OF THE LARGE MAGELLANIC CLOUD
J. V. Feitzinger *In* Astronomische Gesellschaft Astron. Soc. Inform. No. 51 1981 p 159-174 refs In GERMAN; ENGLISH summary (For primary document see N82-16975 07-88)
Avail: NTIS HC A08/MF A01

N82-16993# Astronomische Gesellschaft, Hamburg (West Germany).
THE MASS (STAR NUMBER)-RADIUS RELATIONS FOR THE CLUSTERS OF THE LARGE MAGELLANIC CLOUD
E. H. Geyer and U. Hopp *In its* Astron. Soc. Inform. No. 52 1981 p 71-74 refs (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16994# Astronomische Gesellschaft, Hamburg (West Germany).
NON-STATIONARY VISCOUS GASEOUS DISKS IN NUCLEI OF DENSE STELLAR SYSTEMS
W. Glatzel and K. J. Fricke *In its* Astron. Soc. Inform. No. 52

1981 p 74-75 Sponsored in part by the German Science Foundation (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16995# Astronomische Gesellschaft, Hamburg (West Germany).
EQUILIBRIUM AND STABILITY OF ROTATING STELLAR CORES WITH FINITE ENTROPY
W. Glatzel, K. J. Fricke, and M. ElEid *In its* Astron. Soc. Inform. No. 52 1981 p 75-76 refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16997# Astronomische Gesellschaft, Hamburg (West Germany).
EVOLUTION AND NUCELOSYNTHESIS OF MASSIVE POP 111 STARS
W. W. Ober, M. ElEid, and K. J. Fricke *In its* Astron. Soc. Inform. No. 52 1981 p 118-119 refs Sponsored in part by the German Science Foundation (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-16999# Astronomische Gesellschaft, Hamburg (West Germany).
NUCLEAR ACTIVITY IN SO, SBO - GALAXY NUCLEI
G. F. O. Schnur and W. A. Sherwood *In its* Astron. Soc. Inform. No. 52 1981 p 130-131 (For primary document see N82-16986 07-88)
Avail: NTIS HC A08/MF A01

N82-17062*# Clemson Univ., S.C. Dept. of Physics and Astronomy.
KINETIC THEORY IN ASTROPHYSICS AND COSMOLOGY
John R. Ray *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-17007 Academy of Sciences (USSR), Moscow.
THE ROLE OF THE CRITICAL IONIZATION VELOCITY PHENOMENA IN THE PRODUCTION OF INNER COMA COMETARY PLASMA
V. Formisano (European Space Research and Technology Center, Noordwijk, Netherlands), A. A. Galeev, and R. Z. Sagdeev 1981 23 p refs
(Rept-626) Copyright. Avail: Issuing Activity

The critical velocity required to trigger the anomalous ionization of a neutral gas by plasma flow is theoretically calculated for a model based on lower hybrid instability. It depends strongly on the plasma and gas parameters, defining the instability development of the ionized atoms beam in the counter-streaming plasma. In particular, the possible role of a critical ionization mechanism for Halley's comet is examined. The fulfillment of both the Townsand condition for the self-sustained beam plasma discharge and the Alfven condition for the critical velocity mechanism indicates that this mechanism may work only within 10,000 km from the cometary nucleus and gives the ion production rate close to that observed for the Kohoutek comet. M.G.

N82-17008*# Indiana Univ., Bloomington.
RECONNAISSANCE AND RECOVERY OF THE BRIGHTER ASTEROIDS. BRIEF SUMMARY OF THE ENTIRE PROJECT Final Technical Report
Frank K. Edmonson and H. John Wood 28 Feb. 1982 17 p refs
(Grant NAGw-98)
(NASA-CR-165101) Avail: NTIS HC A02/MF A01 CSCL 03B

An inexpensive method of baking large (8- by 10-inch) IIIa-J plates in 2 percent forming gas was found and successfully tested. The large storage capacity and fine grain structure of the emulsion made the sky fog negligible on plates of one-hour exposure at Link. Plates were taken through the end of October 18, 1981 on various asteroids from the recent critical lists published in the Minor Planet Circulars and the Russian Ephemeris of Minor Planets. A.R.H.

N82-17009*# Planetary Science Inst., Pasadena, Calif.
VIKING ORBITER STEREO IMAGING CATALOG
Karl R. Blasius, Amelia V. Vertrone, Blake H. Lewis, and Michael D. Martin (JPL, Pasadena, Calif.) Washington NASA Feb. 1982 404 p refs
(Contracts NASw-3208; JPL-954149)
(NASA-CR-3501) Avail: NTIS HC A18/MF A01 CSCL 03B

The extremely long mission of the two Viking Orbiter spacecraft produced a wealth of photos of surface features. Many of these photos can be used to form stereo images allowing the student of Mars to examine a subject in three dimensional. This catalog is a technical guide to the use of stereo coverage within the complex Viking imaging data set. Author

N82-17010*# National Aeronautics and Space Administration, Washington, D. C.
ADVANCES IN PLANETARY GEOLOGY
Alex Woronow, ed. Nov. 1981 722 p refs
(NASA-TM-84412) Avail: NTIS HC A99/MF A01 CSCL 03B

Three dissertations are provided covering (1) the stochastic evolution of asteroidal regoliths and the origin of brecciated and gas-rich meteorites; (2) ridge systems on Mars; and (3) the morphology and evolution of Ganymede and Callisto. For individual titles, see N82-17011 through N82-17013.

N82-17011*# Arizona Univ., Tucson. Dept. of Planetary Sciences.
THE STOCHASTIC EVOLUTION OF ASTEROIDAL REGOLITHS AND THE ORIGIN OF BRECCIATED AND GAS-RICH METEORITES Ph.D. Thesis
Kevin Richard Housen *In* NASA. Washington Advan. in Planetary Geol. Nov. 1981 p 1-218 refs (For primary document see N82-17010 07-91)
Avail: NTIS HC A99/MF A01 CSCL 03B

A model is constructed which views regolith evolution on asteroids as a stochastic process. Average values are shown to be poor descriptors of regolith depth. The utility of the average depth is not significantly increased by avoiding large craters or thick ejecta deposits, a procedure adopted in previous regolith studies. The statistical uncertainty associated with regolith depth severely limits the power of regolith models in predicting parent-body size for brecciated meteorites. A Monte Carlo algorithm was used to simulate the random walks and corresponding charged-particle irradiation histories of grains in regoliths. On rocky asteroids, only about 20 percent of the grains was exposed to solar cosmic ray ions. Results based on present-day conditions in the asteroid belt agree well with irradiation features observed in gas-rich meteorites. An origin during epochs of early solar system evolution is not required. N.W.

N82-17012*# George Washington Univ., Washington, D.C. Graduate School of Arts and Sciences.
RIDGE SYSTEMS OF MARS M.S. Thesis
Ann Windslow Gifford *In* NASA. Washington Advan. in Planetary Geol. Nov. 1981 p 222-364 refs (For primary document see N82-17010 07-91)
Avail: NTIS HC A99/MF A01 CSCL 03B

Mare-type ridges on the Planet Mars were mapped and described based on Viking images. The ridges mapped range from 5 to 400 km long and 1 to 8 km wide. Most ridges on Mars are on plains and plateau units; 4,321 ridges with a total length of 153,835 km were mapped on these unit types. Ridges which resemble lunar mare ridges were also mapped in craters, basins, and several volcanic calderas on Mars. Mapping

of ridges on a global scale reveals that they are preferentially developed in older, thinner plains units probably of flood basalt origin. Measuring the trends of ridges in plains units on Mars shows that there is a planetwide predominance of north, northwest and northeast trends. It is proposed that ridges are compressional tectonic features which have formed in response to changes in the planet's rotational equilibrium figure early in its history. In addition, the Tharsis uplift has created a regional stress system which accounts for the trends of ridges in areas near by. Ridges in craters and basins are similarly caused by shortening across the basin in response to regional stresses. N.W.

N82-17013*# Cornell Univ., Ithaca, N. Y.
THE MORPHOLOGY AND EVOLUTION OF GANYMEDE AND CALISTO Ph.D. Thesis
Steven Weldon Squyres *In* NASA. Washington Advan. in Planetary Geol. Nov. 1981 p 369-718 refs (For primary document see N82-17010 07-91)
Avail: NTIS HC A99/MF A01 CSCL 03B

Images of Ganymede and Callisto, Jupiter's two largest moons, among the largest known predominantly icy planetary objects, were obtained by the two Voyager spacecraft. Voyager images were used to investigate the surface characteristics, geologic processes, and internal evolution of Ganymede and Callisto. Ganymede shows two principal types of terrain: one dark, old, and heavily cratered; and another brighter, younger, and characterized by complex patterns of grooves. Voyager imagers were used to determine photometric properties of surface features on both bodies at phase angles up to 120 deg. Surface temperatures are calculated for the major terrain types. Callisto is found to be somewhat warmer than Ganymede. The temperature difference between grooved and cratered terrain on Ganymede is small. A model for the origin of grooved terrain is considered in which extension creates broad, downdropped rift zones in the crust that are filled with water or ice from below. N.W.

N82-17064*# University of Western Kentucky, Bowling Green. Dept. of Physics and Astronomy.
RAY TRACING STUDIES OF JUPITER'S MAGNETOSPHERE
N. Frank Six *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 16 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-17014*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIATIONS OF THE SOLAR CONSTANT
Sabatino Sofia, ed. Dec. 1981 285 p refs Workshop held in Greenbelt, Md., 5-7 Nov. 1980
(NASA-CP-2191) Avail: NTIS HC A13/MF A01 CSCL 03B

The variations in data received from rocket-borne and balloon-borne instruments are discussed. Indirect techniques to measure and monitor the solar constant are presented. Emphasis is placed on the correlation of data from the Solar Maximum Mission and the Nimbus 7 satellites. For individual titles, see N82-17015 through N82-17041.

N82-17015*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SENSITIVITY OF THE EARTH'S CLIMATE TO CHANGES
Gerald R. North *In its* Variations of the Solar Constant Dec. 1981 p 1-10 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Climate modeling is discussed with emphasis on the control of major parameters in such modeling. Possible feedbacks which operate on long time scales and are therefore not testable directly, are also discussed. Examples of simplified models are presented. The accuracy of several models is assessed and suggestions for improvements for climatic modeling are given. T.M.

N82-17016*# San Diego State Univ., Calif. Dept. of Astronomy.
REVIEW OF GROUND-BASED MEASUREMENTS
Ronald J. Angione *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 11-30 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Early measurements of the solar constant are described and discussed with particular emphasis on the Smithsonian program. A brief description is given of the monitoring program currently operating at San Diego State. T.M.

N82-17017*# Denver Univ., Colo.
CHANGE IN THE SOLAR CONSTANT BETWEEN 1968 AND 1978
John J. Kosters and David G. Murcray *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 31-36 refs (For primary document see N82-17014 07-92)
(Grant NSF ATM-79-03877)
Avail: NTIS HC A13/MF A01 CSCL 03B

Solar irradiance measurements made from a balloon on January 27, 1978 and February 10, 1980 show a change of 0.4% over similar measurements made in 1968. This change is greater than the uncertainty of the measurement and is felt to be the result of a change in the solar constant. T.M.

N82-17018*# Physikalisch-Meteorologisches Observatorium, Davos (Switzerland).
THE VARIABILITY OF THE SOLAR OUTPUT
Claus Froehlich *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 37-44 refs Sponsored by the Swiss National Science Foundation (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

A review of solar constant determinations and measurements of its spectral distribution is presented. For the period from 1966 to 1980 a mean value of 1367 Wm-2 was determined. Within the corresponding uncertainty, no significant change of both the integral value and the spectral distribution can be detected. However, short term solar variations and their spectral dependence were deduced from measurements during four hours on June 20, 1980 from 34 km altitude with amplitudes of + or - 500 ppm at 368 nm, of 200 ppm at 500 nm and + or - 150 ppm at 778 nm. Comparison with simultaneous total irradiance data of the Solar Maximum Mission (SMM) shows a high correlation which indicates the solar origin. The power spectrum shows a weak peak at about 3.2 mHz, which corresponds to the frequency of the 5 minutes solar oscillation. T.M.

N82-17019*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SUMMARY OF RESULTS FROM SOLAR MONITORING ROCKET FLIGHTS
Charles H. Duncan *In its* Variations of the Solar Constant Dec. 1981 p 45-58 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Three rocket flights to measure the solar constant and provide calibration data for sensors aboard Nimbus 6, 7, and Solar Maximum Mission (SMM) spacecraft were accomplished. The values obtained by the rocket instruments for the solar constant in SI units are: 1367 w/sq m on 29 June 1976; 1372 w/sq m on 16 November 1978; and 1374 w/sq m on 22 May 1980. The uncertainty of the rocket measurements is + or - 0.5%. The values obtained by the Hickey-Frieden sensor on Nimbus 7 during the second and third flights was 1376 w/sq m. The value obtained by the Active Cavity Radiometer Model IV (ACR IV) on SMM during the flight was 1368 w/sq m. T.M.

N82-17020*# Eppley Lab., Inc., Newport, R.I.
SOLAR VARIABILITY INDICATIONS FROM NIMBUS 7 SATELLITE DATA
J. R. Hickey, B. M. Alton, F. J. Griffin, H. Jacobowitz (NOAA), P. Pellegrino (NOAA), E. A. Smith (Colorado State Univ.), T. H. VonderHaar (Colorado State Univ.), and R. H. Maschhoff (Gulton Industries) *In* NASA. Goddard space Flight Center Variations of the Solar Constant Dec. 1981 p 59-72 refs (For primary

document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

The cavity pyrheliometer sensor of the Nimbus 7 Earth Radiation Experiment indicated low-level variability of the total solar irradiance. The variability appears to be inversely correlated with common solar activity indicators in an event sense. the limitations of the measuring system and available data sets are described. Author

N82-17021*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INDIRECT METHODS FOR MEASURING VARIATIONS OF THE SOLAR CONSTANT
Sabatino Sofia *In its* Variations of the Solar Constant Dec. 1981 p 73-79 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

The difference between the methods that measure delta S, and those that measure variations in the solar luminosity, delta L, is discussed. It is shown that the past practice of simply relating delta S to delta L by geometrical arguments is not valid because of anisotropy of the solar radiation. It is concluded that direct techniques prove the existence of short term variability that is fully explainable in terms of the passage of active regions (spots and faculae) on the face of the Sun. The obervations of changes in the solar diameter support the existence of structurally induced variations of the solar luminosity on timescales of tens of years, which are significant in the understanding of climatic variations. T.M.

N82-17022*# Institute for Advanced Study, Princeton, N.J.
SOLAR NUTRINOS
John N. Bahcall *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 81-93 refs (For primary document see N82-17014 07-92)
(Grant NSF PHY-79-19884)
Avail: NTIS HC A13/MF A01 CSCL 03B

The topics covered include: an overview of the subject of solar neutrinos, a brief summary of the theory of stellar evolution, a description of the main sources of solar neutrinos, a brief summary of the results of the Brookhaven C1-37 experiment, an anaysis of the principal solar neutrino experiments, and a discussion of how solar neutrino experiments can be used to detect the collapse of stars in the Galaxy. A description of how the Ga-71 experiment can be used to decide whether the origin of the present discrepancy between theory and observation lies in conventional solar models or conventional physics is presented. T.M.

N82-17023*# Kitt Peak National Observatory, Tucson, Ariz.
OBSERVED VARIABILITY IN THE FRAUNHOFER LINE SPECTRUM OF SOLAR FLUX, 1975 - 1980
William Livingston, H. Holweger (Inst. fuer Theoretische Physik und Sternwarte, Kiel, West Germany), and O. R. White (National Center for Atmospheric Research) *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 95-109 refs Sponsored by NSF (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Over the five years double-pass spectrometer observations of the Sun-as-a-star revealed significant changes in line intensities. The photospheric component weakened linearly with time 0 to 2.3%. From a lack of correlation between these line weakenings and solar activity indicators like sunspots and plage, a global variation of surface properties is inferred. Model-atmosphere analysis suggests a slight reduction in the lower-photospheric temperature gradient corresponding to a 15% increase in the mixing length within the granulation layer. Chromospheric lines such as Ca II H and K, Ca II 8543 and the CN band head weaken synchronously with solar activity. Thus, the behavior of photospheric and chromospheric lines is markedly different, with the possibility of secular change for the former. T.M.

N82-17024*# Naval Observatory, Washington, D. C.
THE HORIZONTAL AND VERTICAL SEMI-DIAMETERS OF THE SUN OBSERVED AT THE CAPE OF GOOD HOPE (1834 - 1887) AND PARIS (1837 - 1906): A REPORT ON WORK IN PROGRESS
Clayton Smith and Dan Messina (Maryland Univ.) *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 111-116 refs Sponsored by NASA (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Cape and Paris meridian observations of the solar limbs which permit an estimate to be made of the solar semi-diameter were surveyed, sampled, and compared with Greenwich and U.S. Naval Observatory observations. Significant systematic errors were found in the Paris work and have been correlated with changes of instruments and observers. Results from the Cape series indicate that work should continue on the compilation of data from Cape observations of the Sun. T.M.

N82-17025*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ECLIPSE RADIUS MEASUREMENTS
David W. Dunham (Computer Sciences Corp.), Joan Bixby Dunham (Computer Sciences Corp.), Alan D. Fiala (Naval Observatory), and Sabatino Sofia *In its* Variations of the Solar Constant Dec. 1981 p 117-120 refs Sponsored in part by Naval Observatory (For primary document see N82-17014 07-92)
(Contract NAS5-24350; Grant NSF ATM-77-23757)
Avail: NTIS HC A13/MF A01 CSCL 03B

Methods for predicting the path edges and reducing observations of total solar eclipses for determining variations of the solar radius are described. Analyzed observations of the 1925 January eclipse show a 0.7 (arc second) decrease in the solar radius during the past fifty years. T.M.

N82-17026*# Arizona Univ., Tucson. Dept. of Physics.
SCLERA SOLAR DIAMETER OBSERVATIONS
Henry A. Hill, Thomas P. Caudell, and Randall J. Bos *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 123-128 refs Sponsored in part by NASA and DOE (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Focus is given to possible variations in solar luminosity and accurate methods of monitoring it. Aside from direct bolometry, one methodology for this type of research makes use of measurements of the solar diameter and limb darkening function as indirect indicators of the solar luminosity. This approach was reviewed. T.M.

N82-17027*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR RADIUS MEASUREMENTS
T. L. Duvall, Jr. and H. P. Jones *In its* Variations of the Solar Constant Dec. 1981 p 129-130 refs Prepared in cooperation with Kitt Peak National Observatory, Tucson, Ariz. (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Preliminary results of measurements made during 1979-1980 are discussed. Variability in the radius measurements of 0.4 pi is found, of unknown origin. Author

N82-17028*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ESTIMATING SHORT-TERM SOLAR VARIATIONS BY A SIMPLE ENVELOPE MATCHING TECHNIQUE
Kwing L. Chan and Sabatino Sofia *In its* Variations of the Solar Constant Dec. 1981 p 131-136 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

A simple matching technique is explained which allows the computation of the response of the solar surface to perturbations which occur at any depth within the convective envelope of the Sun. This technique was applied to a perturbation of the convective efficiency (alpha-mechanism), and of the non-gas component of the pressure (beta-mechanism) in different regions of the convection zone. The results indicate that either perturbation affects the solar luminosity. However, the alpha-mechanism has little effect in the solar radius, regardless of the location of the perturbed region, whereas the beta-mechanism produces radius changes that become quite large if the location of the perturbed region is deep within the solar convection zone. Author

N82-17029*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

THERMAL PERTURBATION OF THE SUN

L. W. Twigg and A. S. Endal *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 137-142 refs (For primary document see N82-17014 07-92)

(Grant NAG5-13)

Avail: NTIS HC A13/MF A01 CSCL 03B

An investigation of thermal perturbations of the solar convective zone via changes in the mixing length parameter were carried out, with a view toward understanding the possible solar radius and luminosity changes cited in the literature. The results show that: (a) a single perturbation of alpha is probably not the cause of the solar radius change and (b) the parameter W = d lambda nR./d lambda nL. can not be characterized by a single value, as implied in recent work. Author

N82-17030*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EFFECTS OF CHANGES IN CONVECTIVE EFFICIENCY ON THE SOLAR RADIUS AND LUMINOSITY

A. V. Sweigart *In its* Variations of the Solar Constant Dec. 1981 p 143-164 refs (For primary document see N82-17014 07-92)

Avail: NTIS HC A13/MF A01 CSCL 03B

A sequence of solar models has been constructed in order to investigate the sensitivity of the solar radius and luminosity to small changes in the ratio alpha of the mixing length lambda to the pressure-scale height Hp throughout the solar convective envelope. The basic procedure for determining this sensitivity was to impose a perturbation in alpha within the convective envelope and then to follow the resulting changes in the solar radius delta R and luminosity delta L for the next 10 to the 6th power yrs. These calculations gave the following results. (1) A perturbation in alpha produces immediate changes in the solar radius and luminosity. Initially delta L and delta alpha are related by delta L/L = 0.30 delta alpha/alpha. (2) The value of the ratio w = delta log R/delta log L is strongly time dependent. Its value just after the perturbation in alpha is 6.5 x 10 to the minus 4th power. (3) The ratio H = (delta log L) d delta log R/dt is much less time dependent and is a more suitable means for relating the changes in the solar radius and luminosity. (4) Both of these ratios imply that for any reasonable change in the solar luminosity the corresponding change in the solar radius is negligible. Author

N82-17031*# Centre National de la Recherche Scientifique, Paris (France).

AN INSTRUMENT TO MEASURE THE SOLAR SPECTRUM FROM 170 TO 3200 nm ON BOARD SPACELAB

G. Thuiller, P. C. Simon (Inst. d'Aeronomie Spatiale de Belgique), R. Pastiels (Inst. d'Aeronomie Spatiale de Belgique), D. Labs (Landessternwarte), and H. Meckel (Hamburger Sternwarte) *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 165-173 refs (For primary document see N82-17014 07-92)

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This instrument, at the present time in development, will fly on board Spacelab I in May 1983. Other flights are foreseen during the following missions. The instrument is composed of three double monochromators covering the range 170 to 3200 nm. The spectrometers have bandpasses of 1 nm up to 900 nm and 20 nm from 850 to 3200 nm with an accuracy 1/100 nm. Calibration lamps are included in the instrument to monitor any change of its sensitivity and wavelength scale. Author

N82-17032*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

EVOLUTIONARY VARIATIONS OF SOLAR LUMINOSITY

Andrew S. Endal *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 175-183 refs (For primary document see N82-17014 07-92)

(Grants NAG5-13; NSF AST-79-19688)

Avail: NTIS HC A13/MF A01 CSCL 03B

Theoretical arguments for a 30% increase in the solar luminosity over the past 4.7 billion years are reviewed. A scaling argument shows that this increase can be predicted without detailed numerical calculations. The magnitude of the increase is independent of nuclear reaction rates, as long as conversion of hydrogen to helium provides the basic energy source of the Sun. The effect of the solar luminosity increase on the terrestrial climate is briefly considered. It appears unlikely that an enhanced greenhouse effect, due to reduced gases (NH3, CH4), can account for the long-term paleoclimatic trends. Author

N82-17033*# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.

ON THE SEAT OF THE SOLAR CYCLE

Douglas Gough *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 185-206 refs (For primary document see N82-17014 07-92)

Avail: NTIS HC A13/MF A01 CSCL 03B

A discussion of some of the issues raised in connection with the seat of the solar cycle are presented. Is the cycle controlled by a strictly periodic oscillator that operates in the core, or is it a turbulent dynamo confined to the convection zone and possibly a thin boundary layer beneath it? Sunspot statistics are discussed, with a view to ascertaining the length of the memory of the cycle, without drawing a definitive conclusion. Also discussed are some of the processes that might bring about variations delta L and delta R in the luminosity and the radius of the photosphere. It appears that the ratio W = delta lnR/delta lnL increases with the depth of the disturbance that produces the variations, so that imminent observations might determine whether or not the principal dynamical processes are confined to only the outer layers of the Sun. Author

N82-17034*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SHORT AND LONG TERM VARIATIONS IN THE SOLAR CONSTANT

Kenneth H. Schatten *In its* Variations of the Solar Constant Dec. 1981 p 207-217 refs (For primary document see N82-17014 07-92)

Avail: NTIS HC A13/MF A01 CSCL 03B

Short and long term variations in the solar constant are examined theoretically. The variations observed by the Solar Maximum Mission, lasting several days and associated with the passage of sunspot groups, strikingly demonstrates the well known lack of a bright ring effect around sunspots. This suggests that sunspot magnetic fields do not simply block the heat flowing upward into the photosphere. Rather, it is suggested that gravitational draining occurs; this cools sunspots and transports downward the heat that would otherwise flow into the photosphere. A model of sunspot temperature with depth shows modest support when compared with the empirical model of Van't Veer. Secular trends in the solar constant may occur and be associated with the influence of the convection zone magnetic field upon convective heat transport. As a start to understanding this problem, the Schwarzschild criterion has been modified to include the effects of magnetic field. Author

N82-17035*# Lowell Observatory, Flagstaff, Ariz.

MONITORING SOLAR-TYPE STARS

G. Wesley Lockwood *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 219-227 refs (For primary document see N82-17014 07-92)

Avail: NTIS HC A13/MF A01 CSCL 03B

Old UBV and recent uvby photometry of solar-type dwarfs and other standard stars yield an upper limit of variability (determined by observational errors) of about 0.004 mag rms. A factor two improvement in this upper limit is achievable. Author

N82-17036*# Arizona Univ., Tucson. Dept. of Physics.

SOLAR PULSATIONS AND LONG-TERM SOLAR VARIABILITY

Philip R. Goode, Jerry D. Logan, and Harry A. Hill *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 229-233 refs Sponsored in part by NSF, AFOSR and DOE (For primary document see N82-17014 07-92)

Avail: NTIS HC A13/MF A01 CSCL 03B

The seismology of the solar atmosphere is important in relating changes in luminosity to variations in other observables. This approach has already led to the identification of properties

which were not previously observed or recognized. Equally important results from solar seismology are expected in the future. Author

N82-17037*# Carnegie Institution of Washington, Pasadena, Calif.
OBSERVATIONS OF LARGE-SCALE MOTIONS OF THE SUN
Barry LaBonte *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 235-240 refs Sponsored in part by NASA, NSF and ONR (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Recent observations of large-scale mass motions on the Sun are discussed. The principal large-scale velocity flows are convection, rotation, meridional flow, and torsional and radial oscillations. Author

N82-17038*# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
THE COMBINED SOLAR AND TIDAL INFLUENCE IN CLIMATE
P. R. Bell *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 241-255 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

To provide an early warning indication of the CO2 warning signal, we are searching for periodic or projectable trends in climate. The strong 20.5 year oscillation in Eastern North American January temperature found by Mock and Hibler shows evidence of a beat between waves with periods of 22.36 (22.21 to 22.55) years and 18.64 (18.45 to 18.79) years with an opposition at about 1880. These are interpreted to be the 22.279 year solar Hale magnetic cycle and the 18.61 year lunar nodal tidal cycle. The lunar nodal cycle is known to produce changes in the sea surface temperature through increased mixing of the mixed layer of the ocean. This beat note is shown to be evident in the Western High Plains drought record of Mitchell, Stockton and Meko and to provide a better bit to the drought series, especially at the beat oppositions in 1880 and 1770. Author

N82-17039*# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
PREDOMINANT PERIODS IN THE TIME SERIES OF DROUGHT AREA INDEX FOR THE WESTERN HIGH PLAINS AD 1700 TO 1962
P. R. Bell *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 257-264 refs (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

The detection of the combined presence of the Hale magnetic sunspot cycle (22.28 years) and the lunar nodal tidal cycle (18.61 years) in both the Eastern North American January air temperatures and the Western U.S. High Plains drought series led to an extended analysis of the Drought Area Index time series. This analysis indicated that the mean dominant period of the drought series should be 20.0 to 20.5 years and that the principal period should be resolvable into two components of about 22.28 and 18.61 years. This note details the successful accomplishment of this task. Author

N82-17040*# Kitt Peak National Observatory, Tucson, Ariz.
VARIATION OF THE SOLAR He I 1830 A LINE: 1977 - 1980
J. W. Harvey *In* NASA. Goddard Space Flight Center Variations of the Solar Constant Dec. 1981 p 265-272 refs Sponsored by NSF (For primary document see N82-17014 07-92)
Avail: NTIS HC A13/MF A01 CSCL 03B

Daily measurements of the equivalent width of the 10830 A He I line integrated over the visible disk show: (1) an increase from about 32 to about 74 mA in the monthly mean values from the minimum to the maximum of the current solar cycle; (2) the monthly mean values are more smoothly varying than most other indices of solar activity; (3) rotation modulates the daily values in a highly variable manner with amplitudes as large as plus or minus 20%; (4) the apparent synodic rotation period is 29 days rather than the expected 27 days associated with active regions; (5) despite great differences in the appearance of the sun in 3933 A Ca I and 10830 A He I, the central intensity of the former correlates with the equivalent width of the latter with a value r = 0.97. Author

N82-17041*# New York Univ., N. Y. Courant Inst. of Mathematical Sciences.
A PROSPECTUS FOR A THEORY OF VARIABLE VARIABILITY
S. Childress and E. A. Spiegel (Columbia Univ., New York) *In* NASA. Goddard Space Flight Center Variables of the Solar Constants Dec. 1981 p 273-291 refs (For primary document see N82-17014 07-92)
(Grants NSF PHY-77-27086; NSF MCS-79-02766)
Avail: NTIS HC A13/MF A01 CSCL 03B

It is proposed that the kind of stellar variability exhibited by the Sun in its magnetic activity cycle should be considered as a prototype of a class of stellar variability. The signature includes long 'periods' (compared to that of the radial fundamental model), erratic behavior, and intermittency. As other phenomena in the same variability class we nominate the liminosity fluctuations of ZZ Ceti stars and the solar 160 m oscillation. We discuss the possibility that analogous physical mechanisms are at work in all these cases, namely instabilities driven in a thin layer. These instabilities should be favorable to grave modes (in angle) and should arise in conditions that may allow more than one kind of instability to occur at once. The interaction of these competing instabilities produces complicated temporal variations. Given suitable idealizations, it is shown how to begin to compute solutions of small, but finite, amplitude. Author

N82-17042# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
EXPERIMENTAL COMPREHENSIVE SOLAR FLARE INDICES FOR MAJOR AND CERTAIN LESSER FLARES, 1975-1979
Helen W. Dodson, comp. and E. Ruth Hedeman, comp. Jul. 1981 42 p refs Prepared for NOAA, Boulder, Colo.
(PB82-109497; UAG-80; NOAA-81081103) Avail: NTIS HC A03/MF A01 CSCL 03B

Data for solar cycle 20 and information for the ascending branch of cycle 21 are presented. Five components comprise the 'profile' of the flare. The sum of the five gives the comprehensive flare index (CF). Values of the CFI are derived for flares that are considered to have been well above average in either ionizing, H alpha, or radio frequency radiation. GRA

N82-16971# Observatorium Hoher List, Bonn (West Germany).
SOLAR ROTATION AND ACTIVITY IN THE PAST AND THEIR POSSIBLE INFLUENCE UPON THE EVOLUTION OF LIFE
E. H. Geyer *In* Astronomische Gesselschaft Astron. Soc. Inform. No. 50 1980 p 101-104 refs (For primary document see N82-16967 07-88)
Avail: NTIS HC A09/MF A01

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-16109*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARCSECOND POSITIONS FOR MILLIARSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOUCES. PART 1: 546 SOURCES
D. D. Morabito, R. A. Preston, M. A. Slade, and D. L. Jauncey (CSIRO, Sydney) *In its* The Telecommun. and Data Acquisition Rept. 15 Dec. 1981 p 37-48 refs (For primary document see N82-16101 07-12)
Avail: NTIS HC A16/MF A01 CSCL 03B

99 GENERAL

N82-17043*# Alabama Univ. in Huntsville.
THE 1981 NASA/ASEE SUMMER FACULTY FELLOWSHIP PROGRAM: RESEARCH REPORTS Final Report, 1 Jun. - 7 Aug. 1981
Gerald R. Karr, James B. Dozier, Marion I. Kent, and B. F. Barfield Jan. 1982 578 p refs Prepared in cooperation with NASA. Marshall Space Flight Center and Alabama Univ., University
(Grant NGT-01-008-021)
(NASA-CR-161855) Avail: NTIS HC A25/MF A01 CSCL 05I

Research reports related to spacecraft industry technological advances, requirements, and applications were considered. Some of the topic areas addressed were: (1) Fabrication, evaluation, and use of high performance composites and ceramics, (2) antenna designs, (3) electronics and microcomputer applications and mathematical modeling and programming techniques, (4) design, fabrication, and failure detection methods for structural materials, components, and total systems, and (5) chemical studies of bindary organic mixtures and polymer synthesis. Space environment parameters were also discussed. For individual titles, see N82-17044 through N82-17080.

N82-17044*# Tennessee Technological Univ., Cookeville. Dept. of Chemistry.
DEVELOPMENT OF TOUGHENED EPOXY POLYMERS FOR HIGH PERFORMANCE COMPOSITE AND ABLATIVE APPLICATIONS c27
Vernon R. Allen *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 17 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

A survey of current procedures for the assessment of state of cure in epoxy polymers and for the evaluation of polymer toughness as related to nature of the crosslinking agent was made to facilitate a cause-effect study of the chemical modification of epoxy polymers. Various conformations of sample morphology were examined to identify testing variables and to establish optimum conditions for the selected physical test methods. Dynamic viscoelasticity testing was examined in conjunction with chemical analyses to allow observation of the extent of the curing reaction with size of the crosslinking agent the primary variable. Specifically the aims of the project were twofold: (1) to consider the experimental variables associated with development of 'extent of cure' analysis, and (2) to assess methodology of fracture energy determination and to prescribe a meaningful and reproducible procedure. The following is separated into two categories for ease of presentation. M.D.K.

N82-17045*# Vanderbilt Univ., Nashville, Tenn. Dept. of Civil and Environmental Engineering.
A DETERMINATION OF THE CURRENT DENSITY IN ELECTRON BEAMS c72
Robert J. Beil *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 31 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20H

Current gathering rotating probe techniques were used to examine the envelope shape and power density profile of electron beams used in electron beam welding devices. The electron power density contours which determine the shape of the weld vapor cavity, penetration, and local heat distribution were considered. A mathematical analysis consistent with a rotating probe technique necessary to determine the current density distribution (assumed symmetrically radial) in a cross-section of the beam is provided. An explanation of the experimental technique for obtaining data, a BASIC language computer program to determine the current density from the data, and a study indicating the level of confidence to be associated with results obtained are also provided. An example of the application of the analysis to some experimental electron beam data is included. M.D.K.

N82-17046*# Eastern Connecticut State College, Willimantic. Dept. of Mathematical Sciences.
FUEL OPTIMAL MANEUVERS FOR SPACECRAFT WITH FIXED THRUSTERS c18
Thomas C. Carter *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

Several mathematical models, including a minimum integral square criterion problem, were used for the qualitative investigation of fuel optimal maneuvers for spacecraft with fixed thrusters. The solutions consist of intervals of 'full thrust' and 'coast' indicating that thrusters do not need to be designed as 'throttleable' for fuel optimal performance. For the primary model considered, singular solutions occur only if the optimal solution is 'pure translation'. 'Time optimal' singular solutions can be found which consist of intervals of 'coast' and 'full thrust'. The shape of the optimal fuel consumption curve as a function of flight time was found to depend on whether or not the initial state is in the region admitting singular solutions. Comparisons of fuel optimal maneuvers in deep space with those relative to a point in circular orbit indicate that qualitative differences in the solutions can occur. Computation of fuel consumption for certain 'pure translation' cases indicates that considerable savings in fuel can result from the fuel optimal maneuvers. M.D.K.

N82-17047*# Alabama A & M Univ., Huntsville. Dept. of Chemistry.
SOLIDIFICATION PHENOMENA OF BINARY ORGANIC MIXTURES c23
Kichoon Chang *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07A

The coalescence rates and motion of liquid bubbles in binary organic mixtures were studied. Several factors such as temperature gradient, composition gradient, interfacial tension, and densities of the two phases play important roles in separation of phases of immiscible liquids. An attempt was made to study the effect of initial compositions on separation rates of well-dispersed organic mixtures at different temperatures and, ultimately, on the homogeneity of solidification of the immiscible binary organic liquids. These organic mixtures serve as models for metallic pseudo binary systems under study. Two specific systems were investigated: ethyl salicylate - diethyl glycol and succinonitrile - water. M.D.K.

N82-17048*# James Madison Univ., Harrisonburg, Va. Dept. of Mathematics and Computer Science.
TOLERANCE ANALYSIS OF OPTICAL TELESCOPES USING COHERENT ADDITION OF WAVEFRONT ERRORS c74
John W. Davenport *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Feb. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20F

A near diffraction-limited telescope requires that tolerance analysis be done on the basis of system wavefront error. One method of analyzing the wavefront error is to represent the wavefront error function in terms of its Zernike polynomial expansion. A Ramsey-Korsch ray trace package, a computer program that simulates the tracing of rays through an optical telescope system, was expanded to include the Zernike polynomial expansion up through the fifth-order spherical term. An option to determine a 3 dimensional plot of the wavefront error function was also included in the Ramsey-Korsch package. Several assimulation runs were analyzed to determine the particular set of coefficients in the Zernike expansion that are effected by various errors such as tilt, decenter and despace. A 3 dimensional plot of each error up through the fifth-order spherical term was also included in the study. Tolerance analysis data are presented. M.D.K.

N82-17049*# North Georgia Coll., Dahlonega. Dept. of Physics.
DEVELOPMENT OF PHOTOMULTIPLIER ELECTRONICS AND COMPUTER INTERFACING SOFTWARE FOR A HIGH SPEED PHOTOELECTRIC PHOTOMETER-STOKE'S METER c61

Terry R. Flesch *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09B

Preliminary stages in the design, construction, and development of a photoelectric photometer system interfaced with an IMSAI 8080 microcomputer. The instrument will also include magnetic tape and magnetic disk storage capabilities to enable rapid data storage. The capability of the instrument to make observations with very high time resolution, as high as 10 msec, and measure the intensity and polarization of radiation emitted by objects which show very rapid light variations, pulsars and optical counterparts of X-ray sources was of concern. A better understanding of the magnetic fields and interstellar material which characterize the immediate environment of these stellar systems and an expansion of the observational capabilities of even modest-sized telescopes are expected. M.D.K.

N82-17050*# Mississippi State Univ., State College. Dept. of Chemical Engineering.
DEVELOPMENT OF HIGH STRENGTH, HIGH TEMPERATURE CERAMICS c27
William B. Hall *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 11 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

Improvement in the high-pressure turbopumps, both fuel and oxidizer, in the Space Shuttle main engine were considered. The operation of these pumps is limited by temperature restrictions of the metallic components used in these pumps. Ceramic materials that retain strength at high temperatures and appear to be promising candidates for use as turbine blades and impellers are discussed. These high strength materials are sensitive to many related processing parameters such as impurities, sintering aids, reaction aids, particle size, processing temperature, and post thermal treatment. The specific objectives of the study were to: (1) identify and define the processing parameters that affect the properties of Si3N4 ceramic materials, (2) design and assembly equipment required for processing high strength ceramics, (3) design and assemble test apparatus for evaluating the high temperature properties of Si3N4, and (4) conduct a research program of manufacturing and evaluating Si3N4 materials as applicable to rocket engine applications. M.D.K.

N82-17051*# University of Central Florida, Orlando. Dept. of Physics.
A PRELIMINARY STUDY OF THE PARTICULATE FALLOUT FROM THE SPACE SHUTTLE (STS-1) c16
G. Martin Hudson *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 8 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

Prediction of acid fallout and the dry deposition of Al2O3 was the objective of this investigation. Sampling was done at the Kennedy Space Center in Florida. The models available were not appropriate and the data available was negligible. Thus, a bimodal particle distribution was assumed normalized to the few existing data points and used as a foundation for a crude zeroth order approximation for the acid fallout. In addition, a settling spectrum for the Al2O3 particles was devised as a table look-up since the graphs in the literature at first pass could not be fitted with reasonable analytic functions. Consulting services were rendered to researchers. Special emphasis was placed on improving current techniques and adding LIDAR (Light Radar). Suggestions for future studies are made. M.D.K.

N82-17052*# Fort Valley State Coll., Ga. Dept. of Electronic Engineering Technology.
DETECTION AND ANALYSIS OF RADIO FREQUENCY LIGHTNING EMISSIONS c33
Fereydoun Jalali *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09C

The feasibility study of detection of lightning discharges from a geosynchronous satellite requires adequate ground-based information regarding emission characteristics. In this investigation, a measurement system for collection of S-band emission data is set up and calibrated, and the operations procedures for rapid data collection during a storm activity developed. The system collects emission data in two modes; a digitized, high-resolution, short duration record stored in solid-state memory, and a continuous long-duration record on magnetic tape. Representative lightning flash data are shown. Preliminary results indicate appreciable RF emissions at 2 gHz from both the leader and return strokes portions of the cloud-to-ground discharge with strong peaks associated with the return strokes. Author

N82-17053*# Carroll Coll., Helena, Mont. Dept. of Mathematics and Physics.
A STUDY OF THE VENT PIPE FOR THE GRAVITY PROBE-B c15
Ronald N. Knoshaug *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

The Gravity Probe B experiment to test Einstein's relativity theory is a possible Space Shuttle project. Cooling of the gyroscopes and thrusting of the Probe into a zero-drag environment is accomplished by vaporizing liquid helium and venting the gas from the Probe through a nozzle system. In order to avoid malfunctioning of this cooling-thruster system, the pressure difference across the vent pipe-thruster system must be maintained to be less than the vapor pressure of liquid helium at the given temperature. This study investigated helium gas flow through the vent pipe for various configurations, mass flow rates, and pipe diameters. In addition, pertinent properties of both liquid and gaseous helium were investigated. It was observed that helical coiling of the pipe about the Dewar caused less frictional drag and less pressure change than did sharp pipe bending. Also, for various flow rates and nozzle throat area sizes, the system would malfunction for a given bath temperature. Author

N82-17054*# Missouri Univ. -Rolla. Dept. of Metallurgical Engineering.
THE DETERMINATION OF THE STACKING FAULT ENERGY IN COPPER-NICKEL ALLOYS c26
H. P. Leighly, Jr. *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

Methods for determining the stacking fault energies of a series of nickel-copper alloys to gain an insight into the embrittling effect of hydrogen are evaluated. Plans for employing weak beam dark field electron microscopy to determine stacking fault energies are outlined. J.D.H.

N82-17055*# Alabama Univ. in Huntsville. Dept. of Chemistry.
SYNTHESIS OF AMINOSILANE AND AROMATIC DIAMINE INTERMEDIATES FOR POLYMERIZATION c27
Samuel P. McManus *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07C

The preparation of monomers for use in a study to improve properties of epoxy polymers and silicone elastomers is described. Various approaches to the solution of the synthesis of aminosilane and diamine curing agents were examined. Ortho-, meta-, and para-substituted diamines where X is CH2, C(CH3)2, O, S, NH, or SO2 and n = 0, 1, 2, and 3 were investigated. J.D.H.

N82-17056*# Alabama A & M Univ., Huntsville. Dept. of Civil Engineering.
A STUDY OF COMPONENT DESIGN LOADS DUE TO DYNAMIC ENVIRONMENT c39
Rajinder S. Mehta *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 12 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20K

The random vibration of the components of the space shuttle causing internal cargo bay acoustic impingement on the payload was investigated. The import factors to be considered in the design of acoustically loaded structures are the prediction of acoustic environment, prediction of structural response to this environment, and to determine the effect of the response on

the structural strength requirements. Two basic responses were analyzed. The primary structure response due to random vibration is first analyzed. The output of primary structure response is used as an input to the secondary structure to calculate the component response. J.D.H.

N82-17057*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
ATTITUDE CONTROL OF THE SPACE CONSTRUCTION BASE: A MODULAR APPROACH **c18**
Daniel A. OConnor *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 35 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 22B

A planar model of a space base and one module is considered. For this simplified system, a feedback controller which is compatible with the modular construction method is described. The systems dynamics are decomposed into two parts corresponding to base and module. The information structure of the problem is non-classical in that not all system information is supplied to each controller. The base controller is designed to accommodate structural changes that occur as the module is added and the module controller is designed to regulate its own states and follow commands from the base. Overall stability of the system is checked by Liapunov analysis and controller effectiveness is verified by computer simulation. J.D.H.

N82-17058*# Auburn Univ., Ala. Dept. of Mathematics.
A STUDY OF THE GEOGRAPHIC COVERAGE PROPERTIES OF A SATELLITE BORNE DOPPLER LIDAR WIND VELOCITY MEASURING SYSTEM **c47**
Thomas H. Pate *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 26 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

Geographic coverage frequency and geographic shot density for a satellite borne Doppler lidar wind velocity measuring system are measured. The equations of motion of the light path on the ground were derived and a computer program devised to compute shot density and coverage frequency by latitude-longitude sections. The equations for the coverage boundaries were derived and a computer program developed to plot these boundaries, thus making it possible, after an application of a map coloring algorithm, to actually see the areas of multiple coverage. A theoretical cross-swath shot density function that gives close approximations in certain cases was also derived. This information should aid in the design of an efficient data-processing system for the Doppler lidar. J.D.H.

N82-17059*# South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
THE DESIGN AND EVALUATION OF SUPERCONDUCTING CONNECTORS **c33**
James E. Payne *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 10 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09A

The development of a superconducting connector for superconducting circuits on space flights is described. It is proposed that such connectors be used between the superconducting readout loop and the SQUID magnetometer in the Gravity Probe B experiment. Two types of connectors were developed. One type employs gold plated niobium wires making pressure connections to gold plated niobium pads. Lead-plated beryllium-copper spring contacts can replace the niobium wires. The other type is a rigid solder or weld connection between the niobium wires and the niobium pads. A description of the methods used to produce these connectors is given and their performance analyzed. J.D.H.

N82-17060*# South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A STUDY OF OPTICALLY CONTACTED QUARTZ AT CRYOGENIC TEMPERATURES **c74**
Linda L. Payne *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20F

Optical contacting as a method of joining the quartz components of the instruments for the Gravity Probe-B experiment is evaluated. The strength of the bond between optically contacted fused quartz surfaces at liquid helium temperature was investigated. A test apparatus which can be used for making measurements of the tensile strength of these bonds was designed. Results of the tensile pull tests are given and the reliability of such bonds analyzed. J.D.H.

N82-17061*# Clemson Univ., S.C. Dept. of Physics and Astronomy.
MATTER IN GENERAL RELATIVITY **c77**
John R. Ray *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 13 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20J

Two theories of matter in general relativity, the fluid theory and the kinetic theory, were studied. Results include: (1) a discussion of various methods of completing the fluid equations; (2) a method of constructing charged general relativistic solutions in kinetic theory; and (3) a proof and discussion of the incompatibility of perfect fluid solutions in anisotropic cosmologies. Interpretations of NASA gravitational experiments using the above mentioned results were started. Two papers were prepared for publications based on this work. N.W.

N82-17062*# Clemson Univ., S.C. Dept. of Physics and Astronomy.
KINETIC THEORY IN ASTROPHYSICS AND COSMOLOGY **c90**
John R. Ray *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 21 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 03B

Results associated with exact solution of the Einstein-Boltzmann and Einstein-Maxwell-Boltzmann equations are presented. The generalization of Ehler's killing vector approach for the distribution function to charged particles is considered. N.W.

N82-17063*# Alabama Univ. in Huntsville. Dept. of Mathematics.
SURFACE CONTOUR OF A BIAXIALLY STRAINED, DOUBLY CURVED ANTENNA REFLECTIVE MESH **c39**
Annie V. Saylor *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE summer Fac. Fellowship Program Jan. 1982 11 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20K

The elastic membrane equations which describe the deflection of a biaxially tensioned reflective mesh from an idealized surface were developed and solved. The conditions of equilibrium of the forces acting on a membrane element furnish equations which may be used to solve a variety of problems. Configurations considered include continuous, as well as incremental mesh attachment to structural members to form shapes which are approximately parabolic or spherical. N.W.

N82-17064*# University of Western Kentucky, Bowling Green. Dept. of Physics and Astronomy.
RAY TRACING STUDIES OF JUPITER'S MAGNETOSPHERE **c91**
N. Frank Six *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 16 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 03B

Raypaths for decametric wavelength radiation in Jupiter's magnetosphere were calculated. The model-dependent raypaths with the Voyager observations were compared. Characteristics of the source regions and the influence of propagation effects were deduced. A three dimensional ray tracing program was employed to calculate the raypaths. Families of rays were launched at particular angles with respect to the magnetic field lines to generate conical sheets of radiation for various frequencies and various source locations. As the planet's magnetic field rotates, these warped sheets of radiation sweep past the observer, producing signatures in frequency versus time plots. These signatures match some of those found in the Voyager data. The

greatest propagation effects occur in and around the source regions in the Io auroral oval. N.W.

N82-17065*# Newberry Coll., S.C. Dept. of Mathematics and Physics.
THUNDERSTORM ELECTRIC FIELD MODELLING c47
Arjun Tan *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 10 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

Calculation of electric field vectors within and near an isolated thundercloud (which has a given volume charge distribution) is envisaged. The maximum field strength within the thundercloud is calculated. The effects of screening layers, both above and below the thundercloud may be investigated, as well time-dependent potential problem. The study can lead to a better understanding of the charge distributions in a thundercloud, which in turn may shed some light on the actual mechanism of charging of a thundercloud. N.W.

N82-17066*# Alabama A & M Univ., Huntsville. Dept. of Physics.
DETERMINATION OF THE EFFICIENCY OF A PROPORTIONAL COUNTER FOR DETECTING X-RAYS c35
Alton C. Williams *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 6 p (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 14B

A parallel beam of X-rays (approximately monoenergetic) passing through a rectangular slit and scattering from two flat mirrors comprise the X-ray test. The two mirrors are arranged in a periscope geometry so that the final reflected beam is parallel to the incident beam but displaced laterally by given amount. One of the detectors used to intercept the reflected X-rays is a one dimensional gas-filled proportional counter which is sensitive to the position (in 1 dimension) at which the X-rays are incident within its detecting 'window'. The total length of the anode wire of the proportional counter is 120 mm and this length can be divided electronically into a maximum of 1,024 parts. Hence, the output of an experimental run would be the number of incident X-rays that registered on each of the 1,024 channels. Each channel would represent an X-ray at a different spatial location and, hence, at a different scattering angle. In order to look at a wider range of scattering angles, the detector is placed on an optical table which can be rotated. N.W.

N82-17067*# Tennessee Univ. Space Inst., Tullahoma. Dept. of Engineering Science and Mechanics.
SOLIDIFICATION OF A BINARY MIXTURE c26
Basil N. Antar *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 15 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

The time dependent concentration and temperature profiles of a finite layer of a binary mixture are investigated during solidification. The coupled time dependent Stefan problem is solved numerically using an implicit finite differencing algorithm with the method of lines. Specifically, the temporal operator is approximated via an implicit finite difference operator resulting in a coupled set of ordinary differential equations for the spatial distribution of the temperature and concentration for each time. Since the resulting differential equations set form a boundary value problem with matching conditions at an unknown spatial point, the method of invariant imbedding is used for its solution. N.W.

N82-17068*# Alabama Univ. in Huntsville. Dept. of Education.
ASSESSMENT OF MSFC'S SUPERVISORY TRAINING PROGRAMS AND COURSES c80
Thomas A. Brindley *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 13 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 05I

Courses and special programs to train supervisors at Marshall Space Flight Center (MSFC) were to determine the adequacy of the present MSFC Supervisory Training Program and to recommend changes, if appropriate. The content, procedures, and student evaluations of the required Office of Personnel Management (OPM) 80 hours training for supervisors, the optional 120 hours, the MSFC Management Development Program (MDP), NASA's Management Education Program (MEP), various OPM and special contract programs, pertinent procedural guidelines, regulations, and letters, as well as various MSFC computer reports which indicate who took what training were analyzed. Various interviews with MSFC personnel involved in training are included. Recommendations consist of: (1) the choice of courses selected for the basic required OPM 80 hours be improved; (2) the optional 120 hours be discontinued and a shorter module be developed dealing with managerial decision making and human relations skills; (3) the MDP and MEP be continued as at present; and (4) that a broad array of developmental strategies be incorporated to provide a variety of opportunities for supervisory improvement. N.W.

N82-17069*# Alabama Univ., University. Dept. of Mathematics.
DIGITAL COMPENSATION TECHNIQUES FOR THE EFFECTS OF TIME LAG IN CLOSED-LOOP SIMULATION USING THE 6 DOF MOTION SYSTEM c61
Richard Brown *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 30 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 09B

Efforts are continued to develop digital filter compensation schemes for the correction of momentum gains observed in the closed loop simulation of the docking of two satellites using the 6 DOF motion system. Several filters that work well for small delays (< .100ms) and a non-preloaded probe are discussed. N.W.

N82-17070*# Alabama Univ. in Huntsville. Dept. of Physics.
A NEW SPS ANTENNA DESIGN TO REDUCE GRATING LOBES c32
C. H. Chan *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 14 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20N

In the Solar Power Satellite system, the antenna's misalignment will produce well defined grating lobes. These gratings lobe peaks occur every 440 km and are potentially hazardous to the environment. One way to suppress these peaks is to phase control every power module. The cost due to the increase in receiving electronics and processors, however, could prove to be prohibitive. A new design of the antenna involving the addition of two broad gaps, one along the x axis and another along the y axis is proposed. The gap distance is exactly one half of the distance between the center of two neighboring subarrays. Calculation of far field radiation patterns shows that the design reduces grating lobe peaks without sacrificing power in the main lobe. N.W.

N82-17071*# Alabama Univ. in Huntsville. Dept. of Physics.
ALUMINUM AND CHROMIUM ION PARTICLE STUDIES FOR ENHANCEMENT OF SURFACE PROPERTIES c26
In its the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 12 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

An experimental project was undertaken which produced ion plated coatings on steel substrates. About twenty tensile samples of 4340 steel were ion plated in the Denton system with aluminum using resistance heating evaporation boats. In the V.T.A. 7375 system, ten samples were chromium ion plated: four on 4340 steel disks and the other six onto 440-C stainless steel rods for roller bearing wear improvement testing. Each of the samples was plated on a separate run to correlate the film parameters with the run parameters. Some of the chromium literature was reviewed, and improvements to the vacuum system were made. Author

N82-17072*# Alabama Univ. in Huntsville. Dept. of Mathematics.
STATISTICAL ANALYSIS OF DAILY MEAN TEMPERATURES c47

Deva C. Ross *In its* The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1980 13 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 04B

Data of daily mean temperatures recorded at the Kennedy Center during the period of 1957-1977 were analyzed to forecast daily mean temperatures and their thirty-day moving averages for a period of ten to fifteen days in a given month. Since it is found that the standard deviation is linear in the mean, a logarithmic transformation of the data is used for finding an integrated moving average process IMA by the Box-Jenkins aproach. The first differences of the transformed data seem to fit a moving average model with parameter value 2, MA(2). The consideration of seasonality factor makes the fit worse. J.M.S.

N82-17073*# Alabama Univ. in Huntsville. Dept. of Mathematics.
SURFACE CONTROL TEMPERATURES FOR THE BRIDGMAN-STOCKBARGER AND FLOAT ZONE TECHNIQUES c76
Larry M. Foster *In its* the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 14 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20L

The surface control temperature required to properly pose the equations of state for the Bridgman-Stockbarger and float-zone techniques are investigated. Author

N82-17074*# Athens Coll., Ala. Dept. of Biology.
DESIGN CONSIDERATIONS OF A THERMALLY STABILIZED CONTINUOUS FLOW ELECTROPHORESIS CHAMBER 2 c25
Thomas S. Jandebeur *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 6 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 07D

The basic adjustable parameters of a Beckman Continuous Particle Electrophoresis (CPE) Apparatus are investigated to determine the optimum conditions for ground based operation for comparison with space experiments. The possible application of electrically insulated copper/aluminum chamber walls is evaluated as a means to thermally stabilize or equilibrate lateral temperature gradients which exist on the walls of conventional plastic chambers and which distort the rectilinear base flow of buffer through the chamber, significantly affecting sample resolution. J.M.S.

N82-17075*# Baylor Univ., Waco, Tex. Dept. of Mathematics.
MATHEMATICAL PROGRAMMING TECHNIQUES FOR SCHEDULING SPACELAB CREW ACTIVITIES AND EXPERIMENT OPERATIONS c81
William C. Askew *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 19 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 05A

Several mathematical programming techniques which may be applied to the scheduling of experiments and crew activities for Spacelab missions are investigated. The use of currently known methods, in particular zero-one programming and heuristic dispatching is discussed. In addition, a scheduling algorithm and examples to illustrate and test its use are presented. J.M.S.

N82-17076*# Berry Coll., Mount Berry, Ga. Dept. of Physics.
A STUDY OF THE RELATIVISTIC RISE IN IONIZATION AS MEASURED BY ION CHAMBERS OF DIFFERENT DESIGN c72
Julian B. Shand, Jr. *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 7 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20H

Techniques for scheduling with resource-constraints are investigated. In particular, the use of zero-one programming and dispatching methods are discussed. An algorithm which combines characteristics of both existing methods to generate a valid schedule to experiments is introduced. Examples and test results are presented to illustrate the feasibility of the use of this algorithm on data typical to Spacelab missions. J.M.S.

N82-17077*# Alabama A & M Univ., Huntsville. Dept. of Mathematics.
AN INVESTIGATION OF THE UNIFORM RANDOM NUMBER GENERATOR c64
Enoch C. Temple *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 9 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 12A

Most random number generators that are in use today are of the congruential form $X(i+1) + AX(i) + C \bmod M$ where A, C, and M are nonnegative integers. If C=O, the generator is called the multiplicative type and those for which C/O are called mixed congruential generators. It is easy to see that congruential generators will repeat a sequence of numbers after a maximum of M values have been generated. The number of numbers that a procedure generates before restarting the sequence is called the length or the period of the generator. Generally, it is desirable to make the period as long as possible. A detailed discussion of congruential generators is given. Also, several promising procedures that differ from the multiplicative and mixed procedure are discussed. J.M.S.

N82-17078*# Clemson Univ., S.C. Materials Engineering Program.
ON RELATIONSHIP BETWEEN MICROFISSURING AND MICROSTRUCTURE IN THE HAZ OF INCONEL 718 c26
Raymond G. Thompson *In* Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 24 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 11F

Inconel 718, as well as many other metals, is susceptible to intergranular hot cracking in the weld heat-affected-zone (HAZ). These cracks form near the solidus temperature of the metal during the welding process. This problem is of particular concern to NASA/MSFC because the SSME is primarily constructed of welded Inconel 718. The present program studied microfissuring in the weld HAZ of Inconel 718 by simulating HAZ thermal cycles with the Gleeble machine. Previous researchers have studied the instantaneous mechanical properties of the HAZ using the Gleeble. The present study examines the instantaneous microstructure of the HAZ. This approach showed that second phase structures, high in niobium, melt and wet the grain boundaries in the HAZ during welding. It is postulated that the resultant HAZ grain boundaries, enriched in niobium, act as preferred sites for microfissure nucleation as the weld zone cools. J.M.S.

N82-17079*# Alabama Univ. in Huntsville. Dept. of Mechanical Engineering.
HEAT LOSS AND DRAG OF SPHERICAL DROP TUBE SAMPLES c34
Donald B. Wallace *In its* the 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 31 p refs (For primary document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 20D

Analysis techniques for three aspects of the performance of the NASA/MSFC 32 meter drop tube are considered. Heat loss through the support wire in a pendant drop sample, temperature history of a drop falling through the drop tube when the tube is filled with helium gas at various pressures, and drag and resulting g-levels experienced by a drop falling through the tube when the tube is filled with helium gas at various pressures are addressed. The developed methods apply to systems with sufficiently small Knudsen numbers for which continuum theory may be applied. Sample results are presented, using niobium drops, to indicate the magnitudes of the effects. Helium gas at one atmosphere pressure can approximately double the amount of possible undercooling but it results in an apparent gravity levels of up to 0.1 g. J.M.S.

N82-17080*# Wisconsin Univ. - Platteville. Dept. of Civil Engineering.
INCIPIENT FAILURE DETECTION (IFD) OF SSME BALL BEARINGS c37
In Alabama Univ. in Huntsville The 1981 NASA/ASEE Summer Fac. Fellowship Program Jan. 1982 20 p refs (For primary

document see N82-17043 07-99)
Avail: NTIS HC A25/MF A01 CSCL 13H

Because of the immense noise background during the operation of a large engine such as the SSME, the relatively low level unique ball bearing signatures were often buried by the overall machine signal. As a result, the most commonly used bearing failure detection technique, pattern recognition using power spectral density (PSD) constructed from the extracted bearing signals, is rendered useless. Data enhancement techniques were carried out by using a HP5451C Fourier Analyzer. The signal was preprocessed by a Digital Audio Crop. DAC-1024I noise cancelling filter in order to estimate the desired signal corrupted by the backgound noise. Reference levels of good bearings were established. Any deviation of bearing signals from these reference levels indicate the incipient bearing failures.

J.M.S.

N82-17081*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

RESEARCH AND TECHNOLOGY ANNUAL REPORT, 1981 Annual Report, 1981

1981 44 p
(NASA-TM-81333; A-8744) Avail: NTIS HC A03/MF A01 CSCL 05A

Various research and technology activities at Ames Research Center are described. Highlights of these accomplishments indicate the Center's varied and highly productive research efforts for 1981.

Author

N82-17082# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

FLIGHT DYNAMICS TECHNOLOGY DEVELOPMENT: STRUCTURES AND DYNAMICS, VEHICLE EQUIPMENT/ SUBSYSTEMS, FLIGHT CONTROL AND AEROMECHANICS

Dec. 1980 87 p Supersedes AFFDL-TR-79-3133
(AD-A096636; AFWAL-TR-80-3144; AFFDL-TR-79-3133)
Avail: NTIS HC A05/MF A01 CSCL 05/1

The document presents an overview of the four Technical Planning Objectives (TPO) and supporting data for each. These are extracted from the technical plan of the Flight Dynamics Laboratory (FDL). Information is largely based on FDL fiscal 1982 technology plan omitting specific funding and timing information of an 'Official Use Only' nature. Technical objectives are described for the technical areas of Structures and Dynamics, Vehicle Equipment/Subsystems, Flight Control and Aeromechanics. Points of contact for more information in each of the areas are identified.

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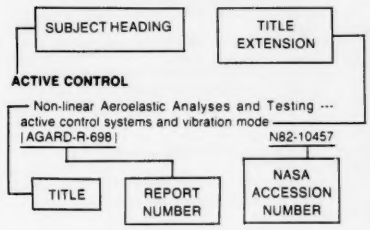
Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

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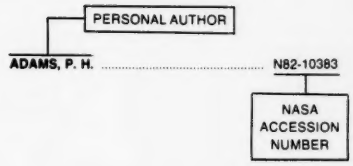

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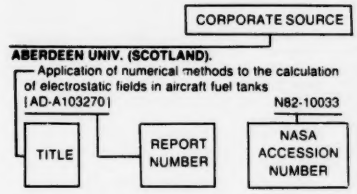

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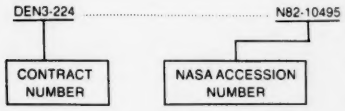

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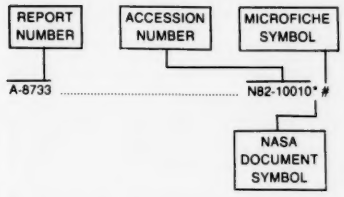

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